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USSR Report

ENERGY

No. 40

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CONTENTS

ELECTRIC POWER

GEOTHERMAL ENERGY USED TO SATISFY HEATING NEEDS

Dushanbe KOMMUNIST TADZHIKISTANA in Russian 1 Oct 80 p 2

[Article by R. Baratov, director of the Institute of Geology of the Tajik SSR Academy of Sciences, and N. Churshina, senior science contributor: "The Earth's Heat into Homes"]

[Text] In its depths the earth conceals huge reserves of hot water and superheated steam which are constantly being regenerated. Scientists have calculated that the potential energy of those reserves located to a depth of only five kilometers greatly exceeds the thermal equivalent of all existing reserves of coal, oil, gas, peat, wood and oil shale taken together.

The subsurface heat of the earth is already being utilized in the economy. It supplies geothermal electric power stations, reducing expenditures for heat supply to cities and population centers and industrial and agricultural installations. In this way, coal, oil and gas, the reserves of which are limited, are conserved.

At the present time, geothermal systems for municipal heat supply are operating in Makhachkala, Paratunka, Zugdidi, Groznyy and Cherkessk. Greenhouse combines are operating in Kamchatka, in the Dagestanskaya, Checheno-Ingushskaya and Buryatskaya ASSR's and in other places. The Pauzhetka geothermal electric power station, first in the USSR, has been put into service. Likewise, the world's first experimental low-temperature freon electric power station operating on the hot-spring waters of the Paratunka formation (Kamchatka) has been commissioned. Industry has assimilated new equipment for geothermal heating and cooling systems.

Often, hot springs are "liquid ore" from which valuable chemical elements may be recovered. Finally, they may serve as a coolant source in hot workshops of metallurgical plants and industrial and civil locations.

Tajikistan is rich in hydrothermal resources. In the mountainous regions there are famous hot-water springs (about 100 degrees) such as Khodzha-Obi-Garm, Tamdykul' and Kalay-Zanku, as well as some at lower temperatures--Obigarm, Obisafed, Khavatag, Yavroz and others (the total output is about 80,000 cubic meters per day).

In Gorno-Badakhshanskaya AO there are hot springs with temperatures of 60 to 85 degrees--Bazardara, Elisu, Dzhelondi, Tokuzbulak, Dzhartygumbez, Kauk, Isaykbulak, Garmchashma and 60 other springs with temperatures of 30 to 40 degrees.

The geothermal conditions in the earth's rock mass on the plains of the republic have been investigated. Here the hot-spring waters can be brought to the surface through deep boreholes. In Leninabadskaya Oblast the geothermy has been studied to a depth of 5,000 meters. The geothermy of the Gissarskaya, Kafirniganskaya, Vakhshskaya and Kulyabskaya valleys has also been investigated. This means that in the future the earth's heat at these sites can also be used in the economy.

The hot subterranean waters of the valley regions of Tajikistan are not only thermal carriers but also a raw material from which a number of minerals (iodine, bromine, potassium, sulfur, etc.) can be obtained. The utilization of such hot-spring waters is bound to be complicated. When using them for a heat supply, it is expedient to drill the bore holes around gas and oil-bearing formations in order to avoid disturbing the head of self-effusing oil deposits.

The utilization of subterranean thermal water for heating purposes is possible and necessary in mountainous regions. However, due to the remoteness of the majority of thermal sources from population centers, the development of the earth's subsurface heat is progressing extremely slowly. The utilization of subterranean hot-spring water for heating resorts holds some promise. The first steps in this direction have so far been taken only at the Khodzha-Obi-Garm health resort. In the coming years hot-spring waters may be used at the hydropathic facility at Yavroz for heating the buildings and hothouses.

The construction of major buildings at the Tamdykul' hydropathic facility is a sound practice. The buildings here can be heated by the subterranean waters. This means that the hothouse can operate year round. Here it is possible to grow vegetables in the heated ground all year long.

The heat of the Kalay-Zanku spring can be used to warm the Dzhirgatal' regional center and the settlement of Kalay-Zanku during the winter. With the help of the Dzelondi hot-water spring, it is possible to heat the settlement of the same name located in the western Pamirs along the Khorog-Osh highway. The underground heat will be able to warm hothouses as well all year long. The underground hot springs of Elisu or Bazardara will help solve the problem of heating the district center of Murgab in the western Pamirs.

The energy balance in the capital can be supplemented with heat from the earth, extracted from Aptian sandstone of the Lower Cretaceous or from fissures in the Paleozoic basement.

It is important that we do not disregard this subterranean wealth. It is necessary that we carry out special scientific research projects. The geology administration of the republic must expand hydrogeological research in order to hold the thermohydrogeological cards in the regions of the republic.
[23-9512]

9512
CSO: 1822

ELECTRIC POWER

WIND-DRIVEN ELECTRIC POWER UNITS UNDERGO TESTING

Baku VYSHKA in Russian 18 Oct 80 p 4

[Article by G. Pogosov: "Get to Work, Wind!"]

[Text] The weather report was optimistic: air temperature 17 degrees, barometric pressure 1026 hectopascals, wind velocity 4-5 meters per second. Test engineer Igor' Malyan engaged the "Tsiklon-6" wind-driven electric power unit. Its three-meter blades began to revolve slowly in a rhythmic dance, increasing revolutions gradually. In the laboratory trailer 100-watt bulbs lit up, the radio receiver and measuring instruments began working, the drilling machine began to sing its working song and the coil in the electric heater grew red. All these devices were supplied with electric power from the "Tsiklon-6."

I am reporting this from the test range of the Mashtaga experimental research base. This base is part of the Southern planning and technological affiliate of the central design bureau at the "Tsiklon" All-Union Scientific and Industrial Association for Wind-Power Engineering, an association belonging to the USSR Ministry of Land Reclamation and Water Resources.

The weather is calm and sunny. The blades of the "Tsiklon-3" and "Tsiklon-6" units of the multi-blade "Apsheron" installation wheel and spin. They draw water from wells, produce electric power and supply both of these to the base.

"It was no accident that the settlement of Mashtaga was chosen as the site to test the wind-power units," explained Nadzhaf Guyseynov, chief of the division for introduction and testing at the Baku affiliate of the "Tsiklon" All-Union Scientific and Industrial Association. "It seems that nature itself had been concerned about this. The mean annual wind velocity on the Apsheron is 4 meters per second. This is the exact minimum parameter at which our "Tsiklon" units begin operating."

The commercially manufactured units produced by the "Vetroenergomash-Tsiklon" plant in Astrakhan are noted for their high cost effectiveness. Comparatively inexpensive, simple and reliable in operation, the "Tsiklon" units pay for themselves after one or two years of use.

We walk up to a first-generation unit. With the help of an inertial pump it can raise water from a 15-meter dug well to the height of a two-story house.

"What are the possibilities for the "Tsiklon" units?" I asked, interestedly.

"Such a unit," elaborated Guseynov, "can supply potable water for two flocks of sheep (1,000 to 2,000 head) or for a cattle farm (up to 200 head). The cost of each cubic meter of of water pumped does not exceed 10 kopecks. "Tsiklon-6" units have become a permanent part of the operations at the Apsheronsk subtropical sovkhoz in Bil'giya, at one of the livestock farms in fraternal Armenia and at a vegetable sovkhoz in Astrakhan Oblast. Tests are now being completed at the range on the "Apsheron" water-pumping unit developed by scientists of the Azerbaijan Academy of Sciences. Equipped with an insert pump, it can provide up to two cubic meters of potable or irrigation water per hour. Utilizing resources on hand, these scientists have begun installing a new unit based on the "Tsiklon-12" wind-power unit. It is designed to supply electric power to the pumps at the station which pump water out of open reservoirs. It is also designed to be connected with distillers for the underground mineral water. The versatility of such units makes it possible to use them for supplying potable water to cattle farms at the level specified by the All-Union State Standard, for irrigating cultivated pasture land, for supplying electric power to entire settlements and for other purposes as well."

In the office of Teymur Safaraliyev, director of the Baku affiliate of the "Tsiklon" All-Union Scientific and Industrial Association, the long-distance telephone rings incessantly and letters and requisitions are constantly being placed on his desk. The affiliate's service range is rather extensive. It includes the republics of the Transcaucasas, Turkmenia, Dagestan, Kalmykia and Astrakhanskaya Oblast. Tearing himself away from his urgent business T. Safaraliyev said:

"Our colleagues in the division are carrying out planning and surveying projects for these regions of the country, as well as scientific research and developmental work. We are employing our local resources to install and adjust wind-driven electric power units on farms and to render technical assistance during the operation of the equipment. We are beginning to develop for Azerbaijan and Turkmenia the technical and economic bases necessary for comprehensive pasture land irrigation projects utilizing subterranean potable-water sources and "Tsiklon" units. In the 11th Five-Year Plan we must install over 200 such standardized units equipped with high-quality helicopter blades in various regions of the country. These are characterized by high efficiency and long service life. We also plan to introduce wind-driven electric power stations."

The inexhaustible resources of wind energy harnessed by the "Tsiklon" units will provide a reliable supply of electricity and water to many farms and will make it possible to keep the environment and the atmosphere clean and untouched.
[23-9512]

9512
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CONSTRUCTION OF EXPERIMENTAL SOLAR HOME PLANNED

Kishinev SOVETSKAYA MOLDAVIA in Russian 4 Oct 80 p 4

[Article by S. Syrbu, division chief at the "Moldvinprom" association "The Sun Heats It"]

[Text] In our republic in recent years more and more attention has been devoted to the problem of the practical utilization of the sun's energy. Its area of application, as is well known, is rather broad. Solar energy is capable of insuring the operation of heating, cooling and air conditioning systems in residential and public buildings. It can also produce electric energy, demineralize water, dehydrate fruits, warm hothouses and much more.

The first house with a solar unit was built in Kriulyany. Experience acquired while operating the unit has shown that a solar water-heater of 12 square meters in area provides during the daylight period about a ton of water at temperatures of up to 70 degrees. This provides completely for the domestic needs of a family of four.

Recently the "Moldvinprom" association approved the design of a new experimental one-room home with a solar unit developed by the "Moldgiprograzhdansel'stroy" Institute. The solution to the solar system's technical problems was suggested by the Kiev Scientific Research Institute of Experimental Design. Its basic element is a solar collector with a southern exposure mounted on the slope of the roof. This provides for heating the water. During the winter when the temperature of the air is less than 7 degrees below zero, an auxiliary electric heater is connected to warm the water. The utilization of the solar water-heater makes possible a fuel savings of about 60 percent. Construction of the home is planned for completion next year in the village of Burkuriy at the "Trifeshta" plant and sovkhoz in the Kagul'skiy rayon.

The goal of the experiment is the further verification of the expediency of using solar powered water-heating systems in individual homes.
[23-9512]

9512
CSO: 1822

ELECTRIC POWER

INADEQUACIES IN RURAL ELECTRIFICATION PROGRAMS EXPLAINED

Moscow EKONOMICHESKAYA GAZETA in Russian No 33, Aug 80 p 18

[Article by V. Prokof'yev, chief engineer of the Volgograd "Oblesel'khozenergo" association, and A. Zemtsov, correspondent for VOLGOGRADSKAYA PRAVDA: "Problems of Rural Electrification"]

[Text] Four years ago the last farms in Volgogradskaya Oblast were connected to the State electric power system. The use of "dvizhoks," low-output diesel generators, was totally discontinued in the villages. Such a move in itself indicates a qualitatively new step in the electrification of kolkhozes and sovkhozes. Electric motors have practically completely replaced combustion engines in water works, irrigation, livestock breeding, feed production, winnowing, loading and unloading operations and warehousing.

Who services the equipment?

At the same time, the level of service of the electrical equipment inventory in agriculture lags considerably behind current requirements. An investigative panel, organized by VOLGOGRADSKAYA PRAVDA in conjunction with experts in electrical engineering to examine the electric power economy, found many instances of equipment neglect and misuse of electric power.

Members of the panel brought to light much equipment that was unused and neglected. For 6 months or more, substations have been inoperative on the Karagichev farm in the Mikhaylovskiy rayon (Kumylzhenskiy sovkhoz), in the village of Savinok in the Pallasovskiy rayon (sovkhoz im. Chapayev) and on the kolkhoz im. Lenin of the Kiselev farm in the Surovikinskiy rayon. While this is going on, the managers of the kolkhoz im. Lenin, for example, demand additional power, and managers at the Kumylzhenskiy sovkhoz have ignored the fact that alongside the inoperative transformer substation are two feed-processing machines for which there just is no power.

One could continue citing examples. Just what are the causes of such a phenomenon, however? It is not only because of sluggishness or neglect, but sometimes simply because of a lack of knowledge on the part of some people in charge of the electric power industry. In our opinion, the farms had been connected to the unified electric power system in order to accelerate growth in the extent of electrification. This had been done without the corresoponding conditions for it being created first. In the first place, on many farms there is a lack of current and long-range planning for the electrification of local production. Work proceeds at a low level without

the corresponding technical and economic basis, at times in violation of standards and regulations. Thus, "idle" substations, electrical equipment with low reliabilty and improper power-supply networks appear. The results of such electrification do not correspond to requirements.

When shops and farms outfitted with similar equipment are put into operation, it is even difficult to maintain the necessary voltage load on the consumer substations and the optimal power unit operating conditions in accordance with certain standards for power consumption. Generally speaking, it is difficult to operate the power plant normally.

Planning power consumption

In place of the well-founded technical and economic standards for power consumption, a limitation system based on the levels achieved has been put together in the villages. These limits are established by the districts to suit themselves. The more power consumed this year, the higher the limit will be next year. When the expenditure is less, the limit is correspondingly lower. As a result, no consideration at all is given to what the power had been used for, who had conserved energy, who had consumed energy excessively or who had wasted it completely.

In our opinion, a differential method is necessary to normalize power consumption in the villages. It would be necessary to establish norms by sections and, feasibly, by months of the year, taking into account agricultural drives and a certain amount of work for irrigation or feed preparation. Certainly, this depends upon the average yield per hectare, the length of the day and other factors that indicate a linear relation between power consumption and agricultural operations. In this case, experts in agricultural economics must have their say in collaboration with power engineers.

There is a need to improve bookkeeping for power plants on kolkhozes and sovkhozes. During inventories, discrepencies are sometimes discovered between the actual and accountable amounts of such equipment. For example, at the kolkhoz im. Kirov in the Kotovskiy rayon, 442 electric motors were carried on the records when, in fact, there proved to be 405. On the Panfilovskiy kolkhoz in the Novoanninskiy rayon, 468 motors were on the books where, in actuality, there were 420. A similar situation was observed at the Rassvet kokhoz in the Surovikinskiy rayon, at the Talovskiy sovkhoz and on other farms.

In our opinion, other criteria must be found for setting the salary of power engineers and for making it closely dependent upon the efficiency of utilization of equipment and power and the end results of their work. At present the salary of power engineers depends basically upon the make-up of the power plant--the more equipment in the power plant, the higher the engineer's salary.

As a rule, losses due to accidents, unplanned shutdowns and power outages are not assessed at kolkhozes and sovkhozes. Essentially, no one is responsible for these losses. On the scale of Volgogradskaya Oblast alone these losses amount to tens of millions of rubles per year.

Some of the kolkhozes and sovkhozes mentioned here complain about the shortfall of electric power and request that the outputs of the transforming substations be in-

creased. If they were to check the operation of the existing substations, they would find that the substations are not operating at full capacity. These facilities fail, as a rule, because of poor maintenance, a lack of automatic regulating devices, etc.

One could continue listing the inadequacies in agricultural power engineering. What conclusions, however, would result? The planning and economic stimulation of the development of electrification in villages must be looked upon as the current starting point. A few years ago we came to the conclusion that it was impossible to get by without judicious centralization of ancillary services according to type in industrial production. The interindustry production and operational enterprises of Sel'khozenergo began to appear, following the example of workers in the Kuban.

Through concerted efforts

Electric equipment maintenance has been reorganized at kolkhozes and sovkhozes and service sections have been formed. However, inasmuch as there is no cost accounting in the electric equipment services for industry and since these services possess all the shortcomings listed above, progressive labor methods are being introduced into service sections and the whole Sel'khozenergo system is being turned around, but slowly. The problems merit the constant attention of not only managers in industry but also of party and Soviet organs, industry ministries and scientific research institutes. It is only through their concerted efforts that a scientifically based cost accounting system can be introduced into village power engineering operations and that these operations can be brought up to the necessary level.

For the present time, however, this is hindered by a multifaceted inertia. Let us just take the pay of a rural power engineer and the planning for the service staff. In our sector the variations in grain yields over the years of the Five-Year Plan are great. Simple logic suggests that when the yield is large, the amount of work performed by the electric equipment in processing the grain increases as well. Consequently, the work load of the rural power engineer and the demands made on him grow. This, however, is not reflected in his salary, and bonuses depend upon subjective relationships with farm managers. The power engineering staffs are not efficiently assigned, either.

Cooperation of kolkhozes and sovkhozes in the form of Sel'khozenergo enterprises has arisen as a result of the aforementioned situation. Even on the oblast level, however, this cooperation is far from perfect in organization and the supply of equipment and materials. In actuality, there are no upper planning echelons, no management, no material and equipment supplies nor provisions for technical and economic standardization. Hence, there is lack of development of fiscal and legal relations between Sel'khozenergo and the farms.

In our opinion, it is necessary to use the efforts of many organizations to develop a long-range program for the formation of centralized agricultural power engineering services, applying the experience of urban power engineering enterprises and of agricultural engineering. In addition, it is necessary to work out such criteria for economic analyses as will guarantee the unity of kolkhoz and sovkhoz interests and those of their centralized interindustry ancillary services. Perhaps we must set out not to orient ourselves on the end results of the agricultural year but on the end results of the tasks of the Five-Year Plan with growing yearly returns and a

rise in the types of production. It is believed that there are various ways of appraising the work of rural power engineers according to the end results of operations at kolkhozes and sovkhozes. We would like to hear other suggestions for increasing the efficiency of utilization of village electric power.
[23-9512]

9512
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ENERGY CONSERVATION

STATIC CAPACITOR BATTERIES SEEN AS ANSWER TO ELECTRICITY LOSSES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Sep 80 p 2

[Article by V. Vladimirov, director of Energosbyt of Dagenergo, and I. Tarikuliyev, head of the sector for automation of the power systems of G. M. Krzhizhanovskiy Dagestan Power Engineering Institute: "Without Losses on the Way"]

[Text] Could it happen that 20% of the finished product of say, an automobile plant one fine day did not reach the consumer and was irrevocably lost on the way? We understand the absurdity of this question. If suddenly even one automobile is not counted this is already an extraordinary event. It is quite another matter with the product of the power engineering enterprises. About 20% of it daily does not reach the consumer and is irrevocably lost on the way. Nevertheless there is a deeply rooted opinion that is is an ordinary phenomenon.

For a start we will estimate together what the loss is from such an "ordinary" phenomenon. Last year, according to the most cautious estimates the losses of electricity on the whole for the country were no less than 249 billion kilowatt-hours. Translated into comparison fuel this is 83 million tons. In order to compensate for such a disappointing (the more so in conditions of a strained fuel and energy balance) leakage it is necessary to build 96 plants like the Chirkeyskiy GES. In a word, in fact this is far from an automobile, and not even a plant. This is your "ordinary" phenomenon!

At the current level of our power services it is 2-fold cheaper to save 10-15% electricity than to produce and reconvert the same amount.

It cannot be said that nothing is being done to conserve energy and fuel resources. The USSR Ministry of Power and Electrification, its board and scientific-technical soviet are formulating and monitoring coordination plans for reducing the electricity losses in all main directions. The energy system annually reports for their fulfillment. Once a quarter the industrial enterprises report on their results to the energy markets of the rayon administrations. Such measures permit the conservation of billions of kilowatt-hours. However the effect could be much greater if the losses were successfully checked in the networks and power transmission lines.

In recent years these losses for the country's energy systems have been kept on the level of 20%, while the networks of enterprise electrical supply los another 11. There is no doubt that a certain portion of the losses is inevitable due to the very nature of electricity. However the reason for the main percentage is the so-called reactive electromagnetic power of the alternating current and it is preventable.

Without going into theoretical details in order not to lead the reader into technical mazes we will simply state that reactive power is a definite load that develops in the power transmission lines and electrical engineering devices during the transmission of an electrical current. It is a necessary condition for the operation of the power equipment, however it is very harmful in the circuits and power transmission lines. The higher the reactive power in the latter, the greater the outlays of energy to overcome the distances.

The reactive power in the circuits and power transmission lines can be significantly reduced if a special device generaces it directly at the consumption site, at the plant or factory. The greater the total of this power at all points of consumption, the lower it is in the circuits. This law has been sufficiently verified both by experiments and in practice.

The majority of countries use static capacitor batteries (abbreviated BSK) as the reactive power generator. For the North Caucasus region the total power of such batteries is 16.6 times lower than required.

What is the matter? Perhaps our compensation resources are technically weak? We would not say so. The Soviet scientists have many advances in this field. The laboratory of system automatics of power systems in the DagENIN [G. M. Krzhizhanovskiy Dagestan Power Engineering Institute] alone in a comparatively short period of activity developed and introduced into production a number of technical solutions on the level of inventions. Some of them have priority in this field over such developed countries as the United States, England, France, and Japan. The main enterprise that produces BSKs is the 25th CPSU Congress Ust'-Kamenogorsk Capacitor Plant. It is constantly improving, diversifying and expanding the output of these items. But the reactive power capacitors are still scarce. Depending on the modification their production is lagging 3-8-fold behind the demand.

It is almost impossible to acquire measuring instruments of reactive power. Perhaps their production is unprofitable, their effect is small and therefore the Ministry of the Electrical Engineering Industry does not increase the output of such batteries and equipment in the necessary quantity? No. The specific cost of a BSK with built-in automatics (in calculation per kilowatt-ampere of rated power) is R 10-12. This is 3 times less than the loss of the electrical circuits. This means that such capacitors are a triple gain for the national economy.

This is an almost unutilized reserve of energy conservation! We hear more and more: strained fuel and energy balance. And here more than half of the losses in the circuits could be completely avoided if by using our and foreign experience of compensating for reactive power we increase the output of BSK. This is equivalent to obtaining at least an additional 10% of fuel that is now burned at the power plants.

As noted at the June meeting of the CPSU Central Committee on questions of the development of power engineering, the level of work to search for and use the reserves of fuel, electricity and heat conservation at the enterprises and in the organizations still does not meet the requirements made.

It is quite obvious that the Ministry of Electrical Engineering Industry and the collectives of the capacitor building plants should take emergency measures. The total annual output of capacitors must be no less than the output of the new power units and power plants put into operation during the year.

The specialists predict that in the distant future the renewable sources of energy (sun, wind, tides) will replace 5-10% of the energy fuel. As we see just as large an addition can be obtained already in our time by using not the fantastic resources of the future, but the equipment that industry is capable of producing now. This can be done on one condition, namely, if we stop seeing energy losses as an ordinary phenomenon.

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ENERGY CONSERVATION

SURPRISE INSPECTION REVEALS WIDESPREAD FUEL PROBLEMS

Moscow IZVESTIYA in Russian 27 Sep 80 p 2

[Article by surprise inspection brigade of IZVESTIYA: A. Kleva, L. Levitskiy, Yu. Perepletkin, G. Shipit'ko: "Winter Makes Strict Demands"]

[Text] An important task faces the many thousands of workers in the collective "Glavtyumenneftegaz." They should extract 303.5 million T of oil from the earth. The assignment of the oil field workers on the whole is being exceeded by more than 1.3 million tons. But far from everything is running with high output. In the association "Nizhnevartovskneftegaz" the extracting administration "Var'yeganneft'" is in debt for 375,000 tons of raw material. The Pokachevskiy, Povkhovskiy and Ur'yevskiy administrations have underproduced 25,000-80,000 each. In Surgut "Kholmogorneft'" is operating with a "minus" of 46,000 tons.

The reasons for the drop in the set assignments are the incompetent use of the available potentialities, shortsighted personnel policy, and violations of the technological requirements. The drillers start the oil stream. Drilling primarily provides the stable extraction of "black gold." But the plan for building producer wells is not being fulfilled. The tunnelers have a high duty: the association "Nizhnevartovskneftegaz" alone underproduced over 377,000 meters of tunneling. This is roughly 160 wells. The indicators of the tunnelers depend on how fast the builders create a clearing in the taiga, how much time it will take for the installers to erect a derrick, whether the power engineers will connect the power transmission line rapidly, and much much more. The sub-contract workers contrive to exceed their plans without providing a work front for the drillers, although this is their main intention. It has long been time for "Glavtyumenneftegaz" to make the success of the sub-contractor workers dependent on the achievement of the final goal, the completion of a finished well.

Every day the Tomsk fields underproduce thousands of tons of oil. Since the beginning of the year the debt has already surpassed 229,000 tons. To be more accurate this is a lag from the already corrected assignment.

Significant changes have occurred in the last 3 years in the oil industry of the oblast. An independent association was set up. The number of workable fields doubled. We will add that they are very far from the available bases. Oil pipelines were rapidly laid to them, power transmission lines, and watch settlements were erected. In 3 years the increase in extraction was almost 3 million. The drilling out of the fields and their pipeline development lagged.

The lag in drilling resulted in the fact that the well fund was not replenished. If there are no springs then the river becomes shallow. It is worse that due to poor organization of production part of the foremen and experienced workers were dismissed. The pipeline development of the fields was slowed down. It is being done by an in-house trust subordinate to the association "Tomskneft'." The schedules for introducing practically all the stations to maintain formation pressure have been interrupted. The level of oil extraction cannot be raised without them.

Inattention to any of the field services has a very painful effect. They forgot about the extractors and immediately standstills of the wells increased and the recovery of oil from them dropped. At the Sovietskiy field every fourth well is idle for the most diverse reasons. If their number was reduced to the norm, the field would yield no less than an additional thousand tons of oil.

The yield from wells at the Vakhskiy field is below the calculated. The reason is that the development of new and the repair of the active wells is delayed. But there are even deeper roots for the lag. A complicated period of transition to mechanized methods of oil extraction has started at all the Siberian fields. There is sufficient equipment for this, but it has low reliability. There are no services to repair it or production bases.

There is yet another misfortune common to the Siberian workers: lack of roads. In order to reach the wells at the same Sovietskiy field it takes days and weeks. The plans for development provided for roads. But they are always left "for later", for tomorrow. It is mandatory to relate here the position of the Ministry of Transport Construction. The ministry stubbornly does not want to develop its facilities in the northern oblast. Thus, in the new Vasyuganskiy oil region it needs to lay a road from the landing on the river Katal'ga to the pioneer settlement and further to the Olen'ye field. For 3 years the contractor has been disrupting all the approved schedules. The construction administration No 917 that is located in Nizhnevartovsk itself cannot get the better of the road although it is complicated to even obtain information with a distance of 300 kilometers. An independent organization is needed, the more so since there is enough work here even for a trust. It is planned to obtain 900,000 tons of oil from the new fields. The drillers and oil field workers are literally stuck in the swamps. The development of the storehouses is delayed. They are now producing only about 230,000 tons. It is true that their assignment has also been corrected, but for whom does this make it easier? There is no oil today, and without it there will be no roads tomorrow.

Our brigade also visited the mine "Mikhaylovskaya" of the association ""Karagandaugol'." In its time this was one of the leading mines in the basin. The highest output for each worker was reached here and the greatest achievement for extraction in a month from one longwall was set. But recently the collective has started to lag. Serious engineering miscalculations are permitted. This resulted in the fact that from the beginning of the year alone the collective has underproduced 200,000 tons of coal.

At a number of mines in the basin, Shakhtinskiy, Aktasskiy, Dubovskiy, imeni Kalinin, accidents with the machines are often permitted and the production discipline has diminished. At the same time there are problems that depend a lot on the USSR Ministry of the Coal Industry. In the 10th Five-Year Plan the branch headquarters issued resources to maintain the active facilities. This is despite the fact that

the mining and geological conditions have become significantly more complicated, and the depth of development and specific outlays for construction-installation work to maintain the facilities have risen.

Another reason is linked to the considerable lag in the mine-tunneling work. More efficient methods for making mine drifts are being slowly developed. Resources of complex mechanization are not extensively introduced. In order to master the new technology for digging beds it is necessary to solve questions of fabricating wear-resistant pipes, and of mastering the production of mechanized complexes for laying pipes in the worked space.

Here is the situation we encountered in the Chitinskaya oblast. In summer the auto-transport was almost not used to haul fuel. As a result, despite the fact that an open pit mine and mine are operating within the city limits the boiler houses entered the heating season without having even 10% of the required amount of coal. "Vostokuglesbyt" was forced to take hundreds of thousands of tons of it from new consumers who were more efficient.

The municipal fuel marketing organization has been called upon to provide for 350 facilities, including boiler houses of children's and preschool institutions. They received 31,000 claims last winter from individual owners as well. Six hundred of them were forced to "warm up" only with promises. They also did not receive the 3,000 cubic meters of firewood they paid for. A day or two ago we visited here and were convinced that this winter many organizations and owners of houses will again be cold. Over 6,000 cubic meters of firewood have already been ordered for the citizens, but there is only half in the storehouse. The main reserves are still in the felling areas that are 300-500 km from Chita. The municipal fuel administration does not have transportation to haul them. It only has several registered machines and two tractors.

The technical equipping of the lumbermen and workers of the fuel industry is an unsolved problem in the Chitinskaya oblast. They do not think here about the workers of such a difficult and important section. The quality of the timber fuel remains low, or more accurately, worthless. An enormous part of it is left to decay in the vast taiga.

It is the duty of the party and soviet organs to intensify the organizational and political work aimed at timely fulfillment of the assignments for extraction, processing and delivery of fuel to the enterprises and population. Winter cannot wait!

9035
CSO: 1822

ENERGY CONSERVATION

DUSHANBE CONFERENCE DISCUSSES DEGREE OF WINTER PREPAREDNESS

Dushanbe KOMMUNIST TADZHIKSTANA in Russian 5 Oct 80 p 2

[Article: "Strict Accounting for Energy Resources"]

[Text] As already reported a zonal conference took place in Dushanbe on improving the energy supply of the national economy and strengthening the pattern of conserving energy resources in the fall-winter period of 1980-1981. Party, soviet, trade union and economic workers, leaders of ministries and administrations of power engineering, production associations and enterprises of the republics of Central Asia and Kazakhstan participated in its work.

The speeches of the conference participants noted that the stable operation of the industrial enterprises, kolkhozes and sovkhozes, transportation and other organizations will depend on the timely and high-quality preparation for winter, the fulfillment of plans for putting energy facilities into operation and major repair of the power equipment, creation of fuel supplies, and the efficient consumption of energy resources for production and in daily life.

An important place in guaranteeing the dynamic and proportional development of the national economy is occupied by the branches of the fuel and energy complex, and first of all power engineering. Leonid Il'ich Brezhnev in a speech at the triumphant meeting in Alma-Ata dedicated to the 60th anniversary of the Kazakh SSR and the Kazakhstan Communist Party called it one of the base branches of industry. The need was stressed for a further increase in the rates of energy power rise. In order to solve this problem, on the personal initiative of Comrade L. I. Brezhnev an energy program is being formulated for the country for the distant future.

One can say without exaggeration that the further economic and social development of the country, strengthening of its defense might, and improvement in the welfare of the Soviet people can only be guaranteed with the leading growth of the energy potential of the national economy.

We are already faced with implementing a broad program of power engineering development in the next five-year plan. In addition it is necessary to intensify the organizational and political work to mobilize the labor collectives to overcome difficulties, to use reserves, strengthen the planning and state discipline, and to eliminate the still many shortcomings and omissions in the work of the power engineers. The leaders of certain energy systems are not focusing proper attention on the fulfillment of the equipment repair plans, and are permitting cases of

poor quality repair work. Often this is linked to the untimely provision of spare parts to the power plants. A number of machine construction enterprises are not observing the contract and planned discipline. They are disrupting the orders of the power engineers. An important task of the machine construction ministries, leaders of the operational and repair organizations, and machine construction enterprises is to eliminate in the shortest time the lag in fulfillment of the planned assignments for repair of equipment of the power plants and supply of spare parts. All the power equipment must be ready for work when the fall-winter maximum of electrical loads begins. The local party and soviet organs must give the managers active assistance by strengthening the lagging sections with workers from other enterprises.

A discussion was held at the conference on guaranteeing reliable energy supply to the consumers in the fall-winter period by timely putting into operation of new power facilities, as well as by eliminating the construction and installation omissions, removing the gaps between the established and the available facilities. Unfortunately far from all the collectives of the construction and installation organizations are aiming at bringing all the newly introduced power facilities in 1980 to participation in covering the maximum loads and eliminating the tight places at the active power facilities. The leaders of the energy systems, construction and installation organizations should take effective measures to eliminate the permitted lag in fulfilling the plan for construction-installation work, and putting into operation new facilities, increase in exactingness for the executors to observe the work schedules and planned assignments.

Attention was drawn to the serious shortcomings in the daily servicing of the toilers engaged in constructing the power facilities. Creation of proper living conditions for people, especially in dormitories is not guaranteed everywhere. The leaders of the enterprises and organizations, local party, soviet and trade union and komsomol organs are obliged to take all measures to eliminate the shortcomings.

Especial attention at the conference was given to the situation with fuel supply for the power plants. Analysis shows that at a number of power plants the assignment for accumulation of fuel is not fulfilled. Above-standard delays are permitted during the unloading of fuel from railroad cars. At many enterprises and associations proper accounting and monitoring have not been organized for consumption of fuel and especially heat. The necessary instruments are missing.

It was noted that it is important to implement additional measures for all-possible saving and more effective consumption of fuel and energy resources, reduction in the losses of fuel and energy, and the broad involvement of secondary energy resources in the turnover.

The leading collectives, shock workers and innovators of production are making a worthy contribution to intensifying the pattern of saving, and improving the useful employment of fuel and energy. However the experience of the leading workers is not employed everywhere. For example, at the Vakhsh nitrogen fertilizer plant the annual losses of electricity exceed 5 million kilowatt-hours.

Regulation of electricity consumption of the industrial enterprises and organizations in the morning and evening peak load hours in the energy systems is important. In the last winter period 13,000 enterprises of the country without damaging the plan

fulfillment guaranteed a reduction in the load in the peak hours by 7.4 million kilowatts.

The conference expressed the confidence that the party, trade union and komsomol active members, people's controllers, and workers of the national economy will apply all their efforts to the timely preparation of the industrial enterprises and residences for winter. They will wage a decisive battle against any manifestations of poor management and wastefulness. The participants of the conference exchanged work experience. They made an excursion to the Nurek GES and the Baypazinskiy GES under construction, and visited the VDNKh [Exhibition of Achievements of the National Economy] of the Tajik SSR.

9035
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BRIEFS

YANLORSKIY OIL FIELD--Surgut (Tyumensakaya oblast) 30 Sep--The raw material base of the Tyumen' oil workers is being strengthened. Today industrial operation of the new Yanlorskiy oil field began. The first wells have been connected to the active system of oil pipelines. [Text] [Moscow PRAVDA in Russian 1 Oct 80 p 1] 9035

SHUL'BINSKIY GES--The most important stage of work has begun at the Shul'binskiy GES that is being constructed on the Irtysh. The first cubic meters of concrete were laid in the base of the lock canal. The power of the Shul'binskiy GES is 1.350 million kilowatts. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 36, Sep 1980 p 2] 9035

DRILLING TOOL--Drogobych--A new drilling tool will accelerate the tunneling of wells under complicated geological conditions. Its series output has been developed at the Drogobych drill bit plant. The first batch of drill bits made of special alloy has been sent to the miners of West Siberia and the Far East. [Text] [Moscow SOTSTIALISTICHESKAYA INDUSTRIYA in Russian 20 Jul 80 p 2] 9035

AUTOMATED CONTROL--Baku--Complete automation of the process of controlling the work of oil and gas wells is permitted by a remote control device. The Kalinin Baku Experimental plant of NIPIneftekhimavtomat [Scientific Research and Planning Institute for Complex Automation of Production Processes in the Petroleum and Chemical Industries] have started to manufacture it. "Neftyanik" is the name for the new device. It is a set of electronic equipment. It executes dozens of functions from controlling the output of oil and gas to determining the presence of water in the fuel mixture. All the information is transmitted to a central dispatcher's point. If there is an emergency shutdown of a well the attendant for the field is immediately notified with indication of the exact site of the event. The experimental batch of the complex has reliably recommended itself at the fields of Tyumen', Bashkiria and Tataria. [Text] [Moscow SOTSIALISTECHSKAYA INDUSTRIYA in Russian 29 Aug 80 p 2] 9035

SAMGORI-BATUMI PIPELINE--The last joint has been welded on the large fuel and energy mainline in the south of the country, the Samgori-Batumi oil pipeline. The "black gold" of the new oil-extracting region of Georgia, passing almost at a thousand meters height through the Suramskiy pass in the Caucasus range moved towards the Black Sea shores. The builders of the Ministry of Construction of Petroleum and Gas Industry Enterprises successfully fulfilled one of the main points in the socialist commitments adopted in honor of the 26th CPSU Congress, namely, to build the oil pipeline Samgori-Batumi in the third quarter of this year on its final segment from the Suramskiy pass to the Black Sea shore. The collective of Glavtruboprovodstroy [Main Administration for Construction of Oil Pipelines and Pipelines] distinguished itself in implementing the precongress commitments. They overcame numerous rocky slopes and precipices and exploded age-old granite cliffs on the path of the mainline. There were numerous obstacles of every description on the route of

the first trans-Georgia oil pipeline: 142 mountain rivers and streams, 466 channels, 80 automobile and railroads, and 99 intersections with other engineering lines. The mainline was laid for 80 kilometers through the Kolkhidy swamp. A large contribution to the creation of the first trans-Georgia oil pipeline was also made by the collectives of the Russian construction-installation trusts of the Ministry of Construction of Petroleum and Gas Industry Enterprises. By actively participating in the precongress socialist competition the builders from Rostov-na-Donu, Krasnodar and Groznyy fulfilled their commitments on the southern route. [Text] [Moscow IZVESTIYA in Russian 28 Sep 80 p 1] 9035

MOLDAVIAN GRES--Dnestrovsk 30 Sep--The collective of builders and installers who are constructing the Moldavian GRES won a labor victory. Today the 12th unit was loaded. With its start-up the power of the republic's largest plant surpassed 2.4 million kilowatts. [Text] [Kishinev SOVETSKAYA MOLDAVIYA in Russian 1 Oct 80 p 1] 9035

ROTARY COMPRESSOR--Kazan'--The world's first rotary compressor was made in the Kazan' special design office for compressor construction. As compared to analogs the machine is 8 times lighter, consumes one-half the electricity and its output is considerably higher. The compressor is capable of working on the most labor-intensive operations: feeding bulk materials, grain, feed, and putting fertilizer into the soil. The innovation was awarded the medal of the VDNKH SSSR [Exhibition of Achievement of the USSR National Economy] and was patented in the United States and England. The Tashkent plant "Kompressor" will have developed its series production by the 26th CPSU Congress.[Text] [Baku VYSHKA in Russian 19 Oct 80 p 1] 9035

WELL EXPLORATION--In the center of Bukhta Il'ich tunneling has begun of development well No 3400 planned for Miocene deposits. There have been two attempts in the last decades to search for fuel at the great depths of this field, but due to the peculiarities of the geological conditions and other reasons no wells were successfully finished. Additional geological studies permitted determination of the most favorable point for placing the new development well and working out the technology to tunnel it. Drilling of the new well has the goal of revealing the oil and gas bearing nature of the Miocene deposits. This drilling has been assigned to the brigade of the experienced drilling foreman Bayram Makhmurzayev. Recently this brigade successfully completed tunneling a development well in Kyurdakhany that opened up the Mesozoic deposits. The amicable collective has started a labor watch in honor of the 26th CPSU Congress. [Text] [Baku VYSHKA in Russian 16 Oct 80 p 2] 9035

KOSTROMA GRES--Kostroma--Testing has begun at the Kostroma GRES of the turbo-unit for the country's first power unit with output of 1.2 million kilowatts. The boiler that will generate steam for the constructed turbine is still being installed. According to the schedule it should be put into operation by the end of the year. The steam has therefore been "borrowed" from the boilers of the active GRES phase. It is fed on pipelines to the turbine vanes and the giant 500-ton rotor is actuated, picking up speed with each revolution. During the "winding up" of the shaft to the rated speed, 3000 rpm, the main test occurs for the performance capacity of all assemblies and systems of the turbo-unit under conditions close to the operational. The steam-heated turbine should "stretch" several centimeters. How do these thermal movements of the metal parts affect the shaft centering and the gaps between the rotor and the stator? How close will the calculated amounts be to the actual?

The million kilowatt unit is experimental. There are no examples of such powerful machines operating on one shaft in the world. Each part is therefore given exceptionally severe tests. The generated electricity will flow into the country's unified system. This will be only a small portion of the powerful stream of energy that the million kilowatt unit is capable of producing. This time is not beyond reach. The Kostroma power builders in honor of the 26th CPSU Congress have adopted the commitment of starting the industrial operation of the giant unit ahead of schedule. [Text] [Moscow IZVESTIYA in Russian 11 Sep 80 p 1] 9035

CSO: 1822

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COMPUTER DETERMINES CALCULATED PARAMETERS OF PETROLEUM STRATA IN THE MIDDLE OB' AREA

Moscow GEOLOGIYA NEFTI I GAZA in Russian No 9, 1980 pp 1-8

[Article by M. G. Zlotnikov, ROME [expansion unknown] All-Union Scientific Research Institute of Nuclear Geology and Geophysics, M. Ya. Zolotova, Logging Section All-Union Scientific Research Institute of Geophysical Investigations of Boreholes, S. M. Zundelevich, N. N. Sokhranov, All-Union Scientific Research Institute of Geophysics, and V. G. Tseytlin, All-Union Scientific Research Institute of Nuclear Geology and Geophysics]

[Text] In the routine interpretation of data from geophysical investigations of boreholes (GIB) on an electronic computer extensive use is made of automated "Karotazh" ["Logging"] [2], Ts-2, "Samotlor-Ts-2" [3], PG-2D and other systems. Recently the archives of programs for the "Karotazh" system has been supplemented by a set of programs developed by the Scientific-Production Combine "Neftegeofizika." The programs are used in implementing the method for determining the calculated parameters and linear reserves of petroleum and dissolved gas, proposed by the All-Union Scientific Research Institute of Nuclear Geology and Geophysics for the polymictic sandstones of Western Siberia.

The "Karotazh" system with the above-mentioned set of programs has been mastered by the All-Union Scientific Research Institute of Geophysical Investigations of Boreholes and was employed in calculating the petroleum reserves in the Fedorovskoye deposit. In order to ascertain the calculated parameters (porosity k_{pore}, petroleum and gas saturation $k_{pet-gas}$ and effective thicknesses H_{eff}) use has been made of the apparent resistivities (AR) obtained using BKZ probes and induction logging (IL), spontaneous polarization (SP) potentials, as well as data from gamma logging (GL), neutron logging using thermal neutrons (NL (T)) and cavernometry (CM). These data were processed for 115 boreholes.

Editing (R-00 program). The AR, SP, GL, NL (T) and CM curves, reduced to digital form, are introduced into an M-222 electronic computer, are corrected for depth, are converted into AR, SP, GL, NL (T) and CM values, expressed in physical measurement units, and are recorded on magnetic tape together with borehole data (in the form of a table of initial characteristics -- TIC [2]).

Determination of boundaries of strata (G-12 set of programs). In order to determine the specific resistivity of rocks in the section on the basis of AR data, measured using a gradient-probe with the length AO = 0.45 m, the strata are discriminated

and their boundaries are determined. The section is broken down into strata in two stages.

In the first stage, on the basis of an analysis of the behavior of the cross-correlation function for the AR curve and the model of the AR curve at the boundary of two strata, it is possible to discriminate the extrema corresponding to the boundaries of homogeneous layers. A series of the following numbers -- -1, -1, -1, +1, +1, +1 -- was used as the AR model at the boundary.

In the second stage the discriminated layers are combined into strata under the condition of closeness of their resistivities. In combining the layers use is made [6] of an analysis of the coefficient of apparent anisotropy λ_{app} of the layer: $\lambda^2_{app} < \lambda^2_{app\ lim}$. The limiting value $\lambda_{app\ lim}$ for the Pedorovskoye deposit was assumed equal to 1.1.

The significant AR values for three BKZ probes (AO = 0.45, 1.05 and 2.25 m) and an IL probe are plotted opposite the discriminated strata. These are then corrected for the influence of the finite thickness of the stratum and screening (for gradient probes) and for the borehole influence (for the IL probe).

The resistivity is then determined using the universal method [1] and employing AR data obtained with the program (G-12) for determining boundaries.

Determination of α_{sp} parameter. The transformation of the initial SP curve into a curve for the α_{sp} parameter is accomplished in two stages.

In the first stage there is a transformation of the SP curve -- a breakdown of the section into strata homogeneous with respect to SP and determination of the significant SP values opposite the strata. These operations are performed using the G-12 program.

In the second stage the significant SP values are corrected for the influence of the finite thickness of the stratum and the resistivity value for the stratum, zones of penetration and country rocks, and also for the diameter of the penetration zone. The corrected significant SP values are transformed into α_{SP} values using the formula:

$$\alpha_{SP} = (a_{clay} - a)/(a_{clay} - a_{sand}),$$

where a are the corrected significant SP values; a_{clay}, a_{sand} are the significant SP values opposite the clay and sandstone strata.

Whereas the programs for study of the resistivity of the section were widely tested earlier, the determination of the α_{sp} parameter for production purposes was carried out for the first time in the Pedorovskoye deposit. For 10 boreholes a comparison was made with the α_{sp} values obtained at the Glavtyumen'geologiya. In 80% of the cases the discrepancies do not exceed 20% and were caused by the different algorithms for determining the corrected SP amplitude (in the manual processing corrections were not introduced for the influence of the parameters ρ_{pore}, $\rho_{gr\ pore}$, D/d), and also by the different choice of reference strata.

Transformation of radiologging curves (G-22 program). In this case provision is made for a breakdown of the radiologging (NL (T) and GL) curves and determination of intensities for the discriminated strata with the introduction of the necessary

corrections for thickness of the strata and the regime for registry of the radiologging (RL) curves. The algorithm for transformation of the RL curves takes into account the statistical nature of the registry of these curves [2]. Within the limits of the strata all the points on the curve must fall in the zone $\bar{I} \pm F$, where $\bar{I}$ is the mean intensity value, F is the magnitude of the fluctuation, equal to $\sqrt{3 \cdot 10^5/\tau}\, \bar{I}$ (τ is the time constant of the integrating element in the radiologging instrument). In the Fedorovskoye deposit the S value was usually assumed equal to 3 (in individual boreholes the value S = 2-2.5 was used for the GL curves). Satisfaction of the following inequality is checked for each pair of discriminated strata (n and n - 1):

$$|\bar{I}_n - \bar{I}_{n-1}| < T,$$

where T is the function of the dispersions of the values $\bar{I}_n$ and $\bar{I}_{n-1}$, the number of degrees of freedom (corresponding to the number of quantization points on the RL curve, the intensity values for which are taken into account in determining the mean intensity value in the stratum) and the quantiles of the Student distribution corresponding to the degrees of freedom [5].

The strata are combined if this inequality is satisfied and the error in determining the intensity of the new stratum does not exceed the minimum error for the group of combined strata.

Lithological breakdown of section (L-14 program). The lithological breakdown and discrimination of collector-strata are accomplished using the L-14 program on the basis of the diagnostic codes method [6]. For this purpose a group of geophysical investigation methods is selected for the region which best solves the formulated problems and which is called "basic." In addition, an additional group of methods is selected for separation of the discriminated strata of the collector and other rocks into intervals homogeneous with respect to some particular parameter (clayiness, resistivity, porosity). The L-14 program was finalized with the forming of a table of the results of routine interpretation in which each discriminated stratum was characterized by the significant values for all the edited diagrams for the complex of geophysical investigation methods.

In the Fedorovskoye deposit in the lithological breakdown of the section in boreholes use was made of SP, NL (T) and GL curves, microsounding and cavernometry curves.

For the most part the complex included data on α_{SP}, data from magnetic sounding and cavernometry; the limiting values were $\alpha_{SP} = 0.4$ for petroleum-bearing strata and $\alpha_{SP} = 0.25$ for gas-bearing strata. Examples of the breakdown of borehole sections are given in Fig. 1. In the case of borehole 120 (see Fig. 1) (nonfiltering mud) use was made of NL (T) data instead of microsounding curves. The strata were divided into uniform intervals using the parameters ρ_{pore}, α_{SP} and porosity. Layers uniform with respect to α_{SP} and ρ_{pore} were discriminated in the first stage of isolation of the collectors; layers homogeneous with respect to porosity were discriminated in the second stage (after application of the G-42 program).

Comparison of the effective thicknesses, determined on an electronic computer and manually (Glavtyumen'geologiya), was carried out for 10 boreholes. The relative error in calculating the total thickness of all strata is +1.2%; for productive strata it is +0.3%. A total of 81% of all determinations of thicknesses were with

an error up to 5%; for productive collectors 54% of the determinations of thicknesses were determined with an error not greater than 5% and 80% with an error not greater than 10%.

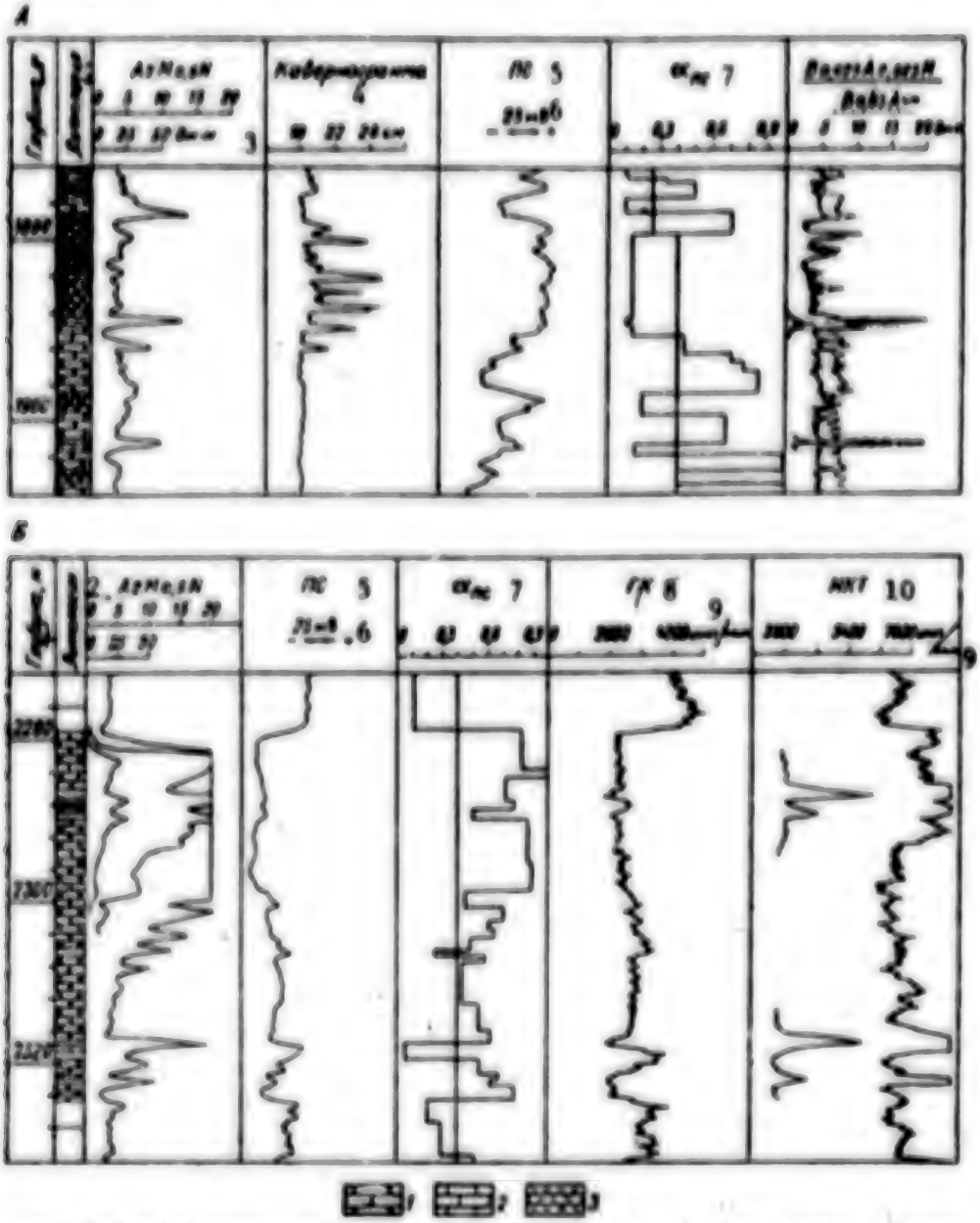

Fig. 1. Results of lithological breakdown of section of boreholes of Fedorovskoye deposit using "Karotazh" system (A -- borehole 96, B -- borehole 120). 1) sandstone, 2) argillite, 3) dense rocks

KEY:

1) Depth, m
2) Lithology
3) ohms·m
4) Cavernogram
5) SP
6) MV
7) α_{SP}
8) GL
9) pulses/min
10) NL (T)

Determination of modal values of NL curves ("Moda" program). Collectors with $\alpha_{sp} \geq 0.7$ are selected below the gas-petroleum contact; these are used in determining the most probable (modal) GL and NL (T) values.

Determination of total hydrogen content (G-42 program). For each stratum the transformed GL curve is used in computing the relative difference parameter GL - ΔI_{GL}. The total hydrogen content W_{Σ} is then determined using NL (T) for all strata by the two reference strata method using the G-42 program [2].

As characteristics of the reference strata use is made of the modal value of curve intensity and the minimum value stipulated by the interpreter, computed using the "Moda" program. It should be noted that such an approach is applicable for the most probable porosity, stable over an area.

The L-14 program is used again for the purpose of supplementing a table of results of routine interpretation of data on hydrogen content and the ΔI_{GL} parameter.

Determination of calculated parameters and linear reserves. The basis for the employed method for determining the calculated parameters is a petrophysical model of a sandy-clayey stratum consisting of a mineral skeleton, clayey material and fluid. The mineral skeleton contains quartz and feldspars; clayey material is subdivided into disperse clay, situated between the grains of the skeleton (its volumetric content is $C_{clay\ disp}$), and thin-bedded ($C_{clay\ thin}$), replacing the rock skeleton (skeletal porosity $k_{pore\ sk}$ -- the volume of pores related to the volume of rock not containing stratified clay).

Within the framework of this model the parameters W_{Σ} (for neutron stationary methods) and ΔI_{GL} are related to the characteristics of the stratum by equations (1) and (2), where the parameters k_{pore}, W and δ with the subscripts "sk, f, clay disp, clay thin" correspond to porosities, hydrogen content and the density of the stratum skeleton, the fluid and the disperse and thin-layered (stratified) clays; g is a parameter inverse to the GL differentiation coefficient; $k^{m}_{pore\ sk}$, δ^{m}_{strat} are the most probable (modal) values of skeletal porosity and the density of nonclayey sandstone

$$W_{\Sigma} = [k_{pore\ sk} - (1 - W_{clay\ disp})C_{clay\ disp}] \times \times (1 - C_{clay\ thin}) + W_{clay\ thin}C_{clay\ thin} \quad (1)$$

$$\Delta I_{GL} = \frac{(g\delta^{m}_{strat}\frac{1 - k_{pore\ sk}}{1 - k^{m}_{pore\ sk}} + \delta_{clay\ disp}C_{clay\ disp}) \times (1 - C_{clay\ thin}) + C_{clay\ thin}\delta_{clay\ thin} - g\delta_{n}}{\delta_{strat}(1 - g)} \quad (2)$$

where δ_{strat} is stratum density, determined using equation (3)

$$\delta = \delta_{sk}(1 - k_{pore\ sk}) + \delta f(k_{pore\ sk}) -$$

$$-C_{clay\ disp}) + \delta_{clay\ disp} C_{clay\ disp}(1 - C_{clay\ thin}) +$$

$$+ \delta_{clay\ thin} C_{clay\ thin} \qquad (3)$$

In describing the conductivity of a particular petrophysical model use is made of the Maxwell formula cited below on the assumption that clayey inclusions have the form of ellipsoids of revolution with the resistivity $\rho_{clay\ thin} = \rho_{clay}$.

$$\rho_{strat} = \rho^{N}_{strat} \times \qquad (4)$$

$$\frac{(1-C_{clay\ thin})\,\rho^{N}_{strat} + [(r-1) + C_{clay\ thin}]\,\rho_{clay\ thin}}{[1 + (r-1)C_{clay\ thin}]\,\rho^{N}_{strat} + (r-1)(1-C_{clay\ thin})\rho_{clay\ thin}}$$

In formula (4) the r value is a parameter determined by the anisotropy of the stratum and dependent on the eccentricity of the ellipsoid; ρ^{N}_{strat} is the noted resistivity of the so-called "normalized" stratum, that is, the stratum in which, all other conditions being equal, there are clayey inclusions equal to their modal value. The parameters k^{N}_{pore}, ρ^{N}_{strat}, $\rho^{N}_{incl\ strat}$, k^{N}_{incl}, $k^{N}_{pet\text{-}gas}$ are determined for such a "normalized" stratum. The $k_{pet\text{-}gas}$ value for a real stratum is obtained using the Komarov formula [4].

Using a graphic solution of the system of equations (1) and (2) it is possible to determine such stratum parameters as $k_{pore\ sk}$, $C_{clay\ disp}$ and $C_{clay\ thin}$ with alternating registry of one of them. Under the conditions of polymictic collectors the $C_{clay\ thin}$ value reflects the total content of feldspar and clayey inclusions. The use of SP data makes it possible to estimate the clayiness $C^{comp}_{clay\ thin}$, free of feldspathicity, and as a result find the porosity value using the formula (5).

$$k_{pore} = [k_{pore\ sk} - C_{clay\ disp}(1 - k_{pore\ clay\ disp})] \times \qquad (5)$$

$$\times (1 - C^{comp}_{clay\ thin}) + C^{comp}_{clay\ thin} k_{pore\ clay\ thin}$$

The algorithm for determining the parameters $k_{pore\ sk}$, $C_{clay\ disp}$ and $C_{clay\ thin}$ is based on formalization of the process of work with the nomogram ABCD (Fig. 2), realizing the graphic solution of the system of equations (1) and (2).

Point A corresponds to a reference nonclayey stratum with the most probable value of skeletal porosity $k_{pore\ sk}$ and the parameters $C_{clay\ thin} = 0$; $C_{clay\ disp} = 0$; the coordinates of the point A are equal to: $\Delta I_{GL} = 0$; $W_{\Sigma} = k^{m}_{pore\ sk}$.

Point B corresponds to a nonclayey sandstone stratum whose porosity is equal to zero (monolithic sandstone stratum, in such sections there are no individual strata); its parameters are: $k_{pore\ sk} = 0$; $C_{clay\ disp} = 0$; $C_{clay\ thin} = 0$; the coordinates of the point are B:$W_{\Sigma} = 0$.

$$\Delta I_{GL} = \frac{[g\delta^{m}_{strat}/(1 - k^{m}_{pore\ sk})] - g\delta_{sk}}{\delta_{sk}(1 - g)}.$$

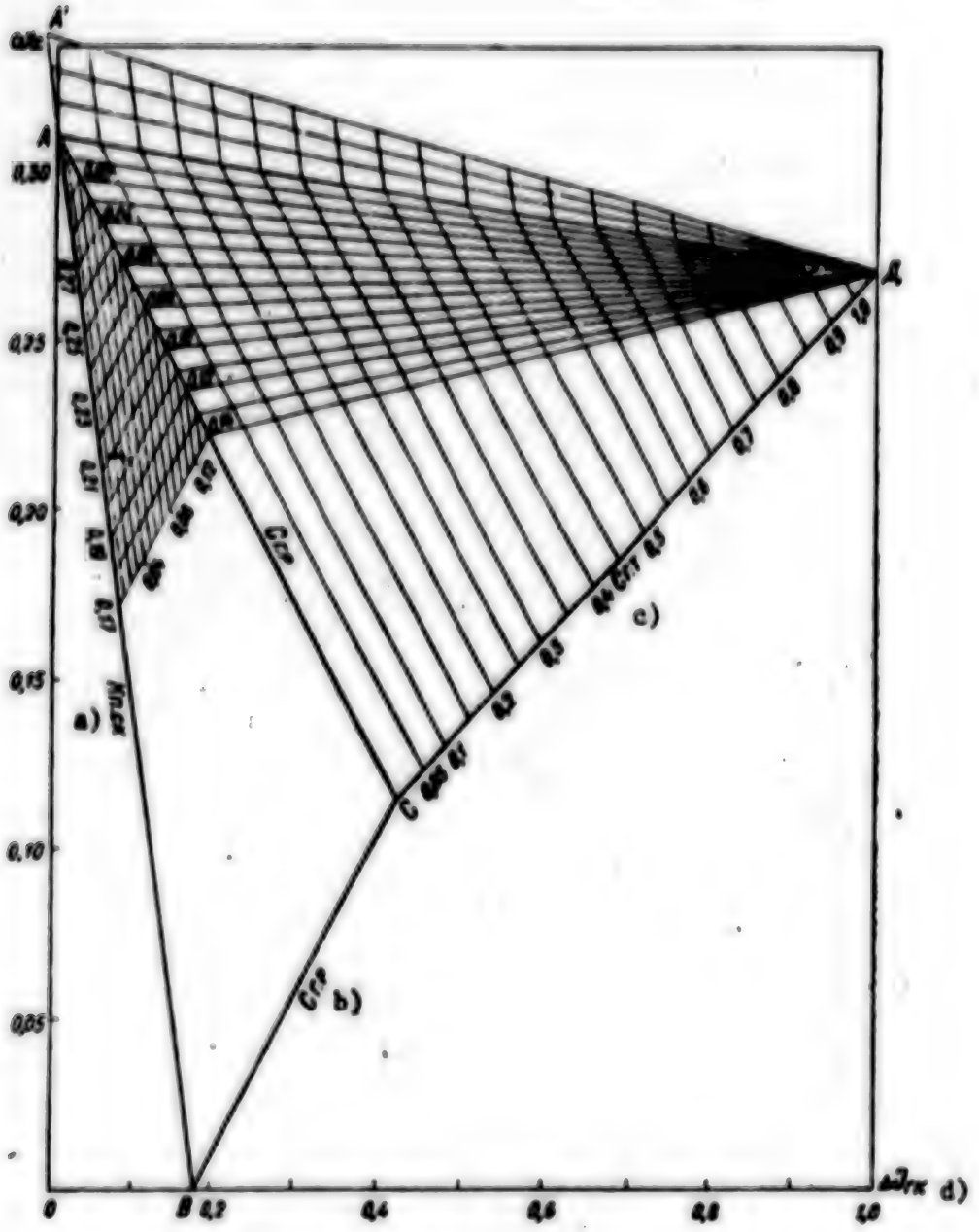

Fig. 2. Nomogram for determining $k_{pore\ sk}$, $C_{clay\ disp}$, $C_{clay\ thin}$.

KEY:

a) $k_{pore\ sk}$
b) $C_{clay\ disp}$
c) $C_{clay\ thin}$
d) ΔI_{GL}

The point C corresponds to a stratum with the parameters $k_{pore\ sk} = k^m_{pore\ sk}$, $S_{clay\ disp} = k^m_{pore\ sk}$, $C_{clay\ thin} = 0$, that is, all the pore space is filled with a clayey cement; the coordinates of point C are

$$\Delta I_{GL} = \frac{g\delta^m_{strat} + \delta_{clay\ thin} k^m_{pore\ sk} - g\delta_{strat}}{\delta_{strat}(1 - g)};$$

$W_\Sigma = k^m_{pore\ sk} W_{clay\ disp}$.

Point D corresponds to a reference clayey stratum in which $k_{pore\ sk} = 0$; $C_{clay\ disp} = 0$; $C_{clay\ thin} = 1$; $\delta_{strat} = \delta_{clay\ thin}$; its coordinates are $\Delta I_{GL} = 1$; $W_\Sigma = W_{clay\ thin}$.

Thus, using the nomogram ABCD, we obtain a possibility for classifying strata by types of collectors. Thus, strata falling in the triangle ABC are sandy collectors with a disperse type of clayiness and are characterized by a constant value of the parameter $C_{clay\ thin} = 0$ and variable $C_{clay\ disp}$ and $k_{pore\ sk}$. The strata belonging to the triangle ACD are characterized by a mixed type of clayiness (varying values $C_{clay\ disp}$ and $C_{clay\ thin}$, constant value $k_{pore\ sk}$ equal to $k^m_{pore\ sk}$). The strata falling in the triangle AA'D have only clayiness in the form of inclusions and are characterized by the variable parameters $k_{pore\ sk}$ and $C_{clay\ thin}$ and a constant value of the parameter $C_{clay\ disp} = 0$.

In order to evaluate the accuracy and reliability of k_{pore} determination on the basis of data from geophysical investigation methods an electronic computer was used in a comparison of $k^{computer}_{pore}$ and k^{core}_{pore} for the entire volume of existing core data (94 strata). It should be noted that for this use was made only of strata having good description on the basis of core data (length of removed core more than 1 m, number of determinations more than 10). The results of the comparison are as follows: systematic error $k_{pore} = k^{computer}_{pore} - k^{core}_{pore} = 0.3\%$; the standard deviation is ±1.5%. The range of change in k^{core}_{pore} (18-30%) and $k^{computer}_{pore}$ (18-32%) is evidence of incomplete removal of unconsolidated, highly porous material.

The coefficient of saturation with petroleum and gas is computed using the formula (6)

$$k_{pet\text{-}gas} = (k^N_{pet\text{-}gas} k^N_{pore}/k_{pore})(1 - C_{clay\ thin}), \qquad (6)$$

where $k^N_{pet\text{-}gas}$ and k^N_{pore} are the corresponding petroleum-and-gas content and porosity of a "normalized" stratum; these coefficients are determined using the formulas (7)-(9):

$$k^N_{pet\text{-}gas} = 1 - \sqrt[n]{b\rho^N_{incl\ strat}/\rho^N_{strat}}; \qquad (7)$$

$$\rho^N_{incl\ strat} = \rho_{incl} a/(k^N_{pore})^m; \qquad (8)$$

$$k^N_{pore} = [k_{pore\ sk} - C_{clay\ disp}(1 - k_{pore\ clay\ disp})] \cdot$$

$$\cdot(1 - C^m_{clay\ thin}) + C^m_{clay\ thin} k_{pore\ clay\ disp}. \qquad (9)$$

The resistivity ρ^{N}_{strat} is found from equation (4). It should be noted that the parameters r, $k_{pore\ clay\ thin}$ and $k_{pore\ clay\ disp}$ used in formulas (4)-(9), n and b -- coefficients of the dependence $\rho_n = f(k_b)$, m and a -- coefficients of the dependence $\rho_{strat} = f(k_{pore})$, $C_{clay\ thin}$, ρ_b are established for a specific deposit.

The coefficients of gas and petroleum saturation of the strata are determined using the formulas (10) and (11):

$$k_{gas} = \alpha (k_{pet-gas})^{\beta}; \quad (10)$$

$$k_{pet} = k_{pet-gas} - k_{gas}, \quad (11)$$

where α and β are coefficients of the dependence of the "gas cap" of a particular deposit. The final parameters of the stratum are the volumetric petroleum- and gas-saturation $W_{pet-gas}$ and the linear reserves of petroleum V_{pet} and gas V_{gas}:

$$W_{pet-gas} = k_{pore} k_{pet-gas};$$
$$W_{pet} = H_{eff} k_{pore} k_{pet};$$
$$W_{gas} = H_{eff} k_{pore} k_{gas}.$$

Table 1

Evaluation of Accuracy of Results of Complex Interpretation of Data from Geophysical Investigation of Boreholes in "Karotazh" System (Fedorovskaya Area, Borehole 120)

Пласт, интервал 1	7 Параметры: $H_{эф}$ 2	$\alpha_{пс}$ 3	ρ_n 4	$k_п$ 5	$k_{пр}$ 6						
	Способ обработки										
	9	10	9	10	9	10	11 керн	10 ЭВМ	12 $\Delta k_п$	10 керн	10 ЭВМ	13 $\Delta k_{пр}$
14 AC_4												
	3.8	3.4	0.39	0.38	10.8	9.3	24.4	23	+1.4	78	73	−3
	4.8	4.8	0.5	0.43	23.8	19.3	78.3	74	+4.3	84	87	−3
	3.0	3.0	0.8	0.64	23.8	14.1	28.5	26.6	+1.9	83	79	+4
	11.4+	11.0+					77.1++	74.4++	+2.7++	79++	80++	−1++
AC_{5-6}												
	3.4	2.8	0.43	0.41	7.3	6.9	23	23.9	+1.1	74	70	+4
	1.6	1.2	0.01	0.75	14.3	10.2	25.8	27.6	−1.8	78	74	+1
	3.7	3.8	0.88	0.78	9.0	8.4	25.5	27.5	−2	75	72	+3
	2.0	2.2	1.08	0.88	14.3	12.2	28.1	28.1	0	77	78	−1
	6.0	6.0	0.84	0.75	10.0	11.7	28.2	27.7	+0.5	77	78	−1
	2.0	2.0	0.84	0.88	6.0	6.8	27.3	29.1	−0.8	74	66	+8
	18.9+	18.8+					78.8++	87.5++	−8.6++	76++	74++	+3++
15 BC_{10}												
	7.8	7.9	0.88	0.83	80	78.2	24.6	28.6	−1	87	91	−4
	3.8	4.0	1.0	0.87	61	61.6	24.3	26.2	−2	83	87	−4
	8.8	8.8	1.0	0.81	50	50.4	26.2	25.8	+0.7	80	85	−5
	1.8	2.0	0.84	0.68	90	12.6	27.8	23.8	+4	84	74	+10
	1.6	1.6	0.86	0.83	6.8	6.1	23.9	22.8	+1.1	80	84	−4
	1.8	1.8	0.43	0.43	6.7	6.1	27.1	27	+0.4	81	84	−3
	31.8+	31.8+					78.1++	78.4++	−0.3++	80++	83++	−3++

11.4+ — суммарные значения; 80++ — средневзвешенные значения.

11.4+ — total values; 80++ — mean weighted values.

KEY:

1. Stratum, interval
2. H_{eff}
3. α_{sp}
4. ρ_{strat}
5. k_{pore}
6. $k_{pet-gas}$
7. Parameters
8. Processing method
9. manual
10. computer
11. core
12. Δk_{pore}
13. $\Delta k_{pet-gas}$
14. AC_4
15. BC_{10}

Processing on an electronic computer is completed by computation of the calculated parameters and the linear reserves for the borehole. In determining the total effective thickness, the porosity, petroleum- and gas-saturation (mean weighted values for the stratum) only those strata are taken into account which lie above the water-petroleum contact and for which the porosity and petroleum- and gas-saturations are above the critical values. The position of the water-petroleum contact is determined automatically from the $k^N_{pet-gas}$ value. However, provision is also made for a variant in which the water-petroleum contact level is stipulated by the interpreter and there is an equating to zero of the linear reserves for strata situated below the water-petroleum contact. The accuracy and reliability of the determinations of the calculated parameters, made on an electronic computer, is illustrated by the table, where they are compared with core and manual processing data. In borehole 120 there was continuous removal of the core, which made it possible to compare the k_{pore} and k_{pet} values for each stratum intersection. In addition, there was a comparison of the calculated parameters and for the boreholes as a whole. The following conclusions can be drawn from the results of the comparison.

1. The thicknesses of the strata of the collectors obtained manually and with an electronic computer virtually coincide and the absolute error does not exceed 0.4 m.

2. The porosity coefficients for the strata AC_{5-8} and BC_{10} agree with data from a core analysis (the absolute error does not exceed 0.4%).

3. The discrepancies between the core data and data from processing on an electronic computer can be seen for the stratum AC_4, which is evidently associated with distortion of the SP in the interval of the stratum AC_4 as a result of the residual influence of the mud on the petroleum base.

4. The coefficients of petroleum- and gas-saturation, computed on an electronic computer, are close to the values determined from the core (the absolute error for the stratum does not exceed 3.5%).

Thus, the results of a complex interpretation of data from a geophysical investigation of boreholes in the "Karotazh" system agree well with the results of manual processing and with core data; they are reliable and can be used in calculating the petroleum and gas reserves.

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TURKMEN GAS RECOVERY, PIPELINE DEVELOPMENTS RECOUNTED

Gas Pipeline for GRES

Moscow PRAVDA in Russian 13 Oct 80 p 1

[Article by F. Ovechkin, staff worker of the newspaper PRAVDA VOSTOKA(Shurtan-Syrdar'inskaya GRES gas pipeline): "The Line Is Being Tested"]

> [Text] The first section of the Shurtan-Syrdar'inskaya GRES trunk gas pipeline, which will connect Central Asia's largest gas deposits with Uzbekistan's highest-capacity electric-power station is undergoing operational tests. The decision was made to turn the trunk pipeline over not in December, as the plan calls for, but in October. The slogan, "Twenty-six shock-work weeks for the 26th CPSU Congress," has become the password for the competition participants.

It has been estimated that each day that is won by starting the trunk line up ahead of time will save the state 1½ million rubles. How is that? In the first place, the Syrdar'inskaya GRES will get a reliable source of inexpensive fuel. It will be possible to put not four of its units under full load, as is the case today, but all eight of them. The operating costs for generating electricity will be reduced by more than half. In the second place the powerful upsurge in the electricity peak will enable hundreds of enterprises to greatly increase output of the products produced. In the third place, billions of cubic meters of gas will arrive at Fergana valley cities, where there is not enough of the blue fuel.

We are at the last kilometer of the route. The construction site is located beside the Syrdar'inskaya GRES itself. High-powered pumps hum busily day and night on the shore of the canal, pumping water into the gas-carrying trunk line. The purpose is to achieve in the pipe a steady pressure of 68 atmospheres. This will prove the readiness of the line to receive gas. Chief engineer Yu. Pichuyev of SU-6 [Construction Administration No 6] of Sredazneftegazstroy [Trust for the Construction of Oil and Gas Industry Facilities in the Central Asian Economic Region] is supervising the tests. Pointing to the manometers, he says:

"For two weeks now the pressure has been rising uniformly, without interruption. This is a sign of high quality of the production operations."

It is here, from the last kilometer of the route, that the construction project supervisors begin their daily flyover of the gas pipeline. And so right now an

MI-8 helicopter, smoothly bouncing upwards, sets its course for Shurtan. Below is a white carpet of cotton grids, yellow squares of tobacco farms, and the spaciousness of grain lands. Nowhere could ditches, trenches or other signs of major earthmoving operations be seen.

Back in the winter, when undertaking trench excavation, Sredazneftegazstroy sent many people and much equipment to the sections that were passing through kolkhoz fields. By April the pipes had been laid, the land had been restored, and the kolkhozes were able to sow their crops on time.

More than 20 specialized administrations took part in installing the gas pipeline. The construction project demonstrated many examples of mutual support of interdependent activities and the motivation of all the collectives for a high final result. For example, Sredazneftegazstroy subunits welded and laid up to 3 km of pipe per day. On finishing installation of their section of the trunk line, they voluntarily undertook to help their neighbor--Bukharagazpromstroy [Trust for the Construction of Gas Industry Facilities in Bukhara]--on a complicated foothills segment of the gas pipeline. As a result, this section of the line also was installed on time.

...After flying along the route, the helicopter landed beside high-powered installations that had been erected by Bukharagazpromstroy and Mubarekgazpromstroy [Trust for the Construction of Gas Industry Facilities of Mubarek] collectives. Gas will be treated there for transporting: scrubbed of condensate, dried and cooled. In the first year, 5.7 billion m^3 of low-sulfur gas will be treated here.

Gas-Recovery Progress

Ashkhabad TURKMENSKAYA ISKRA in Russian 21 Sep 80 p 2

[Article by S. Badalov, deputy chief of the All-Union Industrial Association Turkmengazprom: "The Drillers' Reserves"]

[Excerpts] During the Tenth Five-Year Plan the collective of Turkmengazprom [All-Union Production Association for the Recovery of Natural Gas] faced the task of sharply increasing the output of gas and of opening up new gas reserves. For this purpose, forces of production workers, scientists, makers of new equipment, and production engineers were required and much was achieved in this area.

Turkmengazprom is now doing prospecting, exploratory and development drilling in 31 areas. This year the drillers went to three new areas to expand geological exploration operations: Eastern Yelany, Yelany and Chartak. The Beshkyzyl gas field was discovered. It will become still another source for increasing recovery of the blue fuel. The Dauletabadskoye field is quite promising. Using its stores, it is planned to bring the level of gas recovery up to 77 billion cubic meters by 1985.

During the past 4½ years 24 new areas have been introduced to prospecting drilling (versus only 15 during the Ninth Five-Year Plan), and about 1 million meters were penetrated (versus less than 900,000 meters during the Ninth Five-Year Plan). Ten gas fields were discovered (versus seven during the preceding five-year plan). During this same time gas reserves grew by almost 300 billion cubic meters. Gas recovery has increased from year to year, exceeding Ninth Five-Year

Plan indicators by more than 135 billion cubic meters. A reliable raw-materials base for gas-recovery workers has been established.

This was achieved under difficult conditions. The exploratory and development wells are being drilled in areas that are dispersed and far from supply bases, under severe climatic conditions. The fields, as a rule, have been rendered complicated by the presence of scattered argillaceous rocks, thick saliferous sediments, salt aggressiveness, and a substantial content of calcium and magnesium ions in the brine water that cause difficulties in sinking wells to the planned depth.

Prospecting drilling is now being conducted at great depths--from 4,200 to 4,700 meters. While in 1977 there was not one such well in the association, in the following year more than 29 percent of the year's exploratory meterage was drilled at the indicated depths, in 1979--58 percent.

The success of the stalwart collectives was helped by the wide introduction of new equipment and of advanced technology. Through this factor alone more than 1½ million rubles of state funds were saved last year, and 800,000 rubles have been saved since the start of this year.

But still the pace of penetration for the association as a whole did not reach the planned level. In order to set matters right, measures for intensifying drilling work and for reducing idle time and the accident rate at the holes have been developed. Many problems have now been solved. For example, the increase in depths and the correspondingly increased bottom hole temperatures, formation pressures and high mineralization of the water make special demands on the drilling muds. The reactants previously supplied did not provide the desired qualitative indicators for drilling solutions. Therefore, the use of a mud whose formula was developed by one of Moscow's institutes and that possesses high thermal stability, even under polymineral aggression, began. The formula for the drilling mud, which is stable in the presence of heat and salt, has been successfully introduced at 10 wells. The economic benefit was 80,800 rubles, and complications in the drilling process--sloughs and cavings--were greatly reduced. Also, in 1979, for the first time in the country, we tested the highly effective KMTs-700 reactant, and its industrial mastery has been included in the plan for introducing new technology during 1981.

This year testing began of the reactant-thinner igetan, which enables reduction in the consumption of the basic KMTs reactant--a water-loss reducer--in muds that are weakly or moderately mineralized. It has already been used at three wells. The introduction of high-strength drill string and of casing with high strength and highly sealed joints continues. As a result, the number of accidents and damage to the drilling tool have been sharply reduced, and quality of the casing of the gas wells has been raised. Drilling enterprises have begun to be equipped with highly effective bits. In 1979 alone more than 90,000 meters of penetration had been drilled with them. Increased attention is being paid to cleaning the drilling mud. Mutual checking brigades have been established within production associations to monitor this.

All the innovations that were mentioned above have become an important reserve for raising production effectiveness and work quality. Since the start of the concluding year of the five-year plan, 14 development wells have been transferred to gas-recovery enterprises and their entry into operation is pending. This year the

Neurdenbikskoye gas field will also go into operation. With a view to strengthening work on sampling explored wells, the sampling office has been transferred to Chardzhou and subordinated to Turkmensevburgaz [Association for Drilling Gas Wells in North Turkmenia].

But there are still many conditions that slow up forward motion. Motor vehicles and tractor equipment still are not being used effectively enough, although the fleet is large: almost 1,600 motor vehicles of various makes and 705 units of tractor equipment. However, a substantial portion of the transport stands idle each day. And this is understandable: the lack of roads and increased workload rapidly cause units and components to break down. And the matter of their restoration is considered unimportant. Goskomsel'khoztekhnika [State Committee of the USSR for Providing Agriculture with Production Equipment] bases supply the repairmen poorly with spare parts. In comparison with last year, the supplying of transport enterprises has even worsened. Arrangements for the centralized repair of motor vehicles and tractor equipment at the republic's plants is not turning out well.

Each year the ceiling on use of common-carrier buses is not being satisfied. In 1979, for example, orders were submitted for 339,800 automatic meters, but Turkmen SSR Gosplan allocated only 176,600 automatic meters, and only half that number for 1980. But buses are needed to transport shiftworkers.

Despite the ever-increasing amounts of drilling and the requirements for chemical reactants, the question of fully satisfying the needs of enterprises for modified starch still has not been solved. The amount allocated by the Turkmen regional administration meets the requirement for it by just one-third. Repeated appeals to the territorial administration, Soyuzpishchepromsyr'ye [All-Union Association for Supplying Food and Industrial Raw Materials], has not produced positive results. Each year the drillers experience difficulty because of the lack of V-shaped belts, especially of the large sizes, which are supplied by Turkmenkhimsnabsbyt [Turkmen Administration for the Supply and Marketing of Chemical Products].

There is also a personnel problem. The detachment of production leaders is being augmented with young specialists slowly: 92 engineer and technician positions are vacant right now at drilling enterprises.

The country is expecting from Turkmenia's gas recovery workers a still greater contribution to the creation of a fuel and energy complex. During the Eleventh Five-Year Plan 20 new areas are to be opened up to prospecting, and 600,000 meters of exploratory hole and 80,000 meters of development wells are to be drilled.

In order to reach the contemplated goals, the penetrators of underground arterials must work hard. It is also necessary to improve drilling operations technology and work organization and to introduce scientific and technical achievements. Supplying and other organizations should satisfy more completely the needs of the drillers and gas-recovery workers. It is necessary to prevent worktime losses and idle machinery time caused by various organizational mix-ups. Right now the association's collective is aiming its efforts at completing the Tenth Five-Year Plan properly and at preparing a firm base for successful work in the coming years.

Pipeline Protection Measures

Ashkhabad TURKMENSKAYA ISKRA in Russian 20 Sep 80 p 3

[Article by Shatlykgazdobycha and Turkmentorgreklama (Turkmen Administration for Commercial Claims) Production Associations: "Pay Attention to the Gas Pipe Trunkline!"]

[Text] The Shatlyk Line-Operations Administration for Gas Trunk Pipelines of PO Shatlykgazdobycha [Production Association for Gas Recovery at the Shatlyk Gas Field] notifies all construction organization and institution supervisors, kolkhoz chairmen and sovkhoz directors on whose land sections the high-pressure (55 atmospheres) Mayskoye-Ashkhabad-Bezmein trunk gas pipeline will pass that the gas that is being transported will present an explosion and fire hazard. Any mechanical damage to the pipeline can cause a rupture of the pipeline and be accompanied by an explosion and outbreak of fire, which can lead to casualties.

In order to prevent damage to the trunk gas pipeline, it must be known that a protective zone of 150 meters on both sides of the gas pipeline has been established.

Procedure for Doing Work in the Protective Zone

For purposes of reliable and safe operation of the gas pipeline, the Shatlyk Line-Operations Administration for Trunk Gas Pipelines has developed instructions on safety measures for doing agricultural work and proposes it for decision of the rayon or city ispolkom of the soviet of people's deputies:

reinforced-concrete kilometer posts with warning signs have been established in order to indicate the route of the gas pipeline; and

the lands that comprise the protective zone remain in the possession of the land users and can be used by them for agricultural requirements.

It is prohibited, within the protected zone:

to erect buildings or structures;

to conduct any kind of construction, erection, earthmoving, blasthole drilling or mining operations;

to set up field housing for equipment operators during agricultural operations;

to construct firing ranges or storage for various construction, fuel-and-lubricant or other materials;

to site enclosures for cattle, field mills or transport equipment or to allow people to congregate;

to erect housing structures of any type on sections set aside for individual or collective planting of gardens;

to drive across the gas pipeline at any places other than those designated as passages;

to light bonfires or to burn dry grass; and

to establish at gas pipeline crossings artificial water obstacles, to drop anchors, to build berths or beaches, to set aside fishing sections, or to conduct deepening or dredging operations.

Written permission of the Shatlyk Line-Operations Administration for Trunk Gas Pipelines is required for the conduct of all types of construction work in the protective zone and the strip set aside for the pipeline (the laying of irrigation ditches, trenches, cable and pipelines and other types of earthmoving work).

Work within the strip that has been set aside should be done only in the presence of ShLPUMG [Shatlyk Line-Operations Administration for Trunk Gas Pipelines] representatives.

Persons who permit violation of the rules for doing work within the gas pipelines' protective zone and strip will be called to account under the law.

Comrade superintendents, foremen, operators of excavators, bulldozers and heavy equipment and supervisors of transport brigades, kolkhozes and sovkhozes! Do not forget that it is prohibited to conduct earthmoving operations by mechanized methods within the protective zone of a trunk gas pipeline, since this can lead to damage to the underground gas pipelines!

Underground gas pipelines are indicated locally by /kilometer posts [printed in boldface]/.

REMEMBER that during the period of operation of the gas pipeline since 1969, its depth of burial has been decreased after agricultural work, and at present it is 0.8-1.5 meters from the designed ground surface!

In case gas emission to the earth's surface is observed on the gas pipeline route /report this immediately [printed in boldface]/ to the Shatlyk Line-Operations Administration for Trunk Gas Pipelines of the Shatlykgazdobycha Association.

Drivers of Earthmoving Equipment!

Require of foremen, superintendents and brigade leaders written authorization of the enterprise that operates the gas pipeline for the conduct of earthmoving operations, and pay attention to the warning signs and markers that identify the trunk gas pipeline route.

For all questions related to the conduct of earthmoving work, call the Shatlyk Line-Operations Administration for Trunk Gas Pipelines (ShLPUMG) as follows: Bakar-Chaginskiy Rayon, Shatlyk Settlement, ShLPUMG, telephones Nos 3-61 and 3-69; No 52-82 in the city of Mary; and Nos 5-51-81 and 5-59-64 (the controller) in the city of Ashkhabad.

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DEVELOPMENT OIL-WELL DRILLING DURING EXPLORATION PROFITABLE IN CERTAIN CASES

Moscow EKONOMIKA NEFTYANOY PROMYSHLENNOSTI in Russian No 8, Aug 80 pp 4-9

[Article by L. D. Amerika and M. E. Sinamati (VNIIneft' [All-Union Scientific-Research Institute for Oil and Gas]): "The Economic and Geological Substantiation of the Exploration of Oil Deposits with the Use of Anticipatory Development Drilling"]

[Text] The practice of drilling anticipatory development wells (OES's) at the exploratory stage has spready widely in the work to master oil and oil-and-gas fields. The goals of anticipatory development drilling are:

accelerated introduction of fields into industrial operation;

more detailed study of the properties of the structure of the productive horizon and of the deposits confined therein; and

savings in the amount of exploratory drilling.

An analysis of the use of anticipatory development drilling, which has been practiced in various oil and gas zones of the country, indicates that meeting the enumerated goals requires the observance of definite prerequisites.

In order that OES's may be able to carry out their basic mission of oil recovery, such wells should be drilled on a large scale at known productive sections, where the nature of saturation of the strata has been established, and, in so doing, a definite sequence for drilling the wells should be observed.

The problems of a detailed study of the deposits and of savings in drilling volume can be solved only where OES's are sited correctly and all the necessary oilfield-geology studies thereat have been made. When the indicated prerequisites are not observed, OES drilling does not give the expected benefit. Moreover, if OES's strike a nonproductive portion of the deposit or go beyond the oil-zone boundary, oil-recovery plans are disrupted. In cases where OES's are drilled instead of exploratory wells and the required set of studies is not made, the deposits will remain unprepared for the calculation of reserves and the planning of development, since the OES's are used only to fulfill plans for recovering oil.

Thus the necessity for a differentiated approach to OES drilling as a function of the conditions of oil occurrence is obvious.

This article gives geological and economic substantiation for various options for using development wells for exploration at the various stages of study and under dissimilar geological conditions. The following cases of the use of development wells are examined:

a) anticipatory development wells are drilled instead of exploratory wells after completion of the prospecting stage; b) the field is explored simultaneously by exploratory and development wells; and c) OES's are drilled after the completion of exploration work when the data obtained at the exploratory wells prove to be inadequate for planning development of the field.

Success in the use of OES's for exploration and for the preparation of deposits for development is expressed in the economic benefit obtained from introducing oil facilities into operation ahead of schedule and from the expenditures saved by replacing exploratory meterage with anticipatory development meterage.

Technical and economic evaluation of the different variants of the anticipatory development drilling used is based upon computing the indicators that characterize conditions for sinking exploratory and anticipatory development wells. These indicators include the duration and cost of drilling said holes. The economic indicators by which the variants are compared are computed in accordance with standards obtained as a result of analyzing exploration of areas already drilled over.

Comparability of the variants in the examples examined below is achieved by use of an equal number of drilling brigades in the variants.

We have prepared examples of the use of development wells to study deposits right after completion of the prospecting stage, based upon data from the development of smaller oilfields.

The economic desirability of drilling development wells right after the completion of prospecting is shown in the example of a Kuybyshevskaya Oblast field, which we have designated by the letter A. This field is confined to a small deposit 2.5x1.5 km in size. The field had been under exploration for 3 years. During this period 8 deep exploratory holes--1 for prospecting and 7 for exploration--were drilled; 4 of them proved to be outside the oil-zone boundary and were eliminated. The technical and economic indicators of this variant for exploring field A are shown in the table.

A second possible variant introduced in the example proposes study of the given field's structure and of the conditions for the occurrence of oil only by development wells.

The economic effectiveness of the proposed variants was compared when the field had been drilled over with development wells. The number of holes necessary for fully drilling over the examined deposits, which was calculated on the basis of their dimensions and the distance between wells that was adopted, was 15. This takes account of the first hole, which yielded oil, and the remainder, which were intended for development of the deposits, as well as of the wells that can prove to be outside the oil-zone boundary (there were 4 of them, that is, the number of exploration holes outside the oil zone in variant 1, and the total number of development wells that should be drilled through at the field in variant 2 is 18).

Indicators	Field A		Field B		Field C	
	1	2	1	2	1	2
Total number of holes drilled, units....	19	19	26	21	40	40
Exploratory holes.....	8	1	18	1	14	40
OES's*.....	11	18	8	20	26	-
Number of holes that gave oil, units....	15	15	8	15	31	31
Exploratory wells.....	4	1	1	1	7	31
OES's.....	11	14	7	14	24	-
Average depth of the holes, meters.....	2,300	2,300	3,400	3,400	2,600	2,600
Drilling costs, millions of rubles.....	6.0	5.0	28.5	15.2	22.7	38.0
For exploratory holes.....	3.2	0.4	22.9	1.3	13.3	38.0
For OES's.....	2.8	4.6	5.6	13.9	9.4	-
Duration of drilling, years.....	5.6	3.7	8	5	7.6	9
Additional oil recovered during the period of acceleration of introduction of the field into development, millions of tons.....	-	0.31	-	0.22	0.155	-
Benefit from accelerated introduction of the facility into operation (additional profit), millions of rubles.....	-	1.08	-	2.86	1.2	-
Saving of capital investment for drilling, millions of rubles.....	-	1.8	-	13.30	15.3	-

*OES's--anticipatory development wells.

In variant 1, 11 development wells are necessary for drilling the field over completely in addition to the 4 exploratory holes that gave oil and are working productive horizons.

Calculations were made for purposes of comparing these variants, as a result of which indicators for the duration and cost of the planned wells were found.

In computing expenditures for drilling, the sum of 398,000 rubles was adopted as the average cost for one hole drilled for exploration and 258,000 rubles for one development well, 2,300 meters deep. Total duration of drilling was determined on the basis of the number of planned wells by variant, the time taken to drill them, in days, and the number of drilling brigades assumed in the calculations. The time taken to drill one exploratory hole averaged 104 days (0.28 year), a development well 67 days (0.18 year). In the variants being examined, drilling was accomplished by one drilling brigade, providing for comparability of the variants.

The results of calculations of the basic technical and economic indicators that characterize the two variants of the field A study are shown in the table in summary form.

The data shown in the table indicate that the difference in the system for studying the deposit lead in the given case to a difference in dates of completion of well drilling, as a result of which operation of the facility can be started on different dates. As is evident in variant 2, the pace for starting preparation of the field for operation is higher. In this variant the total time for drilling the wells is reduced by more than 2 years in comparison with variant 1, enabling

the field to be introduced into operation more rapidly. Calculations indicated that during the period of acceleration of the introduction of this hypothetical field into operation (2 years), 0.31 million tons of oil were obtained, the sale of which provided additional profit in the amount of 1.08 million rubles.

In comparing variants by volume of capital investment for drilling the holes, let us note that the advantage also lies with variant 2, which calls for study of deposits basically by drilling development wells, whose cost is much lower than that of exploratory wells. In comparison with variant 1, variant 2 yields a capital investment saving of 1.8 million rubles.

Thus the superiority of variant 2 is evident from the cited analysis, and it should be considered more rational, since it provides for acceleration of introduction of the field into development and a saving in the volume of exploratory drilling. It should be emphasized, however, that variant 2 can be considered better only if the development wells that are drilled through in place of exploratory holes will enable the required information about the structure of the deposit to be obtained in an amount that is adequate for computing reserves and planning development. For this purpose, the set of oilfield-geophysics and hydrodynamic research that has been adopted for exploratory holes in the given region should be executed for this purpose in a portion of the development wells in the intervals of occurrence of the productive horizon into which they will be drilled.

The simultaneous drilling of exploratory holes and anticipatory development wells is the most widespread form for using development drilling for exploring deposits. The most typical cases of combining exploratory and development drilling can be amalgamated into three groups:

1) at small and average-size fields, anticipatory development wells are drilled according to the exploratory grid in sections that are located within the presumed oil-zone boundary at a time when exploratory drilling is being spent on establishing its true position;

2) at fields that are marked by complicated structure as a consequence of the presence of multiple reservoirs, substantial depth of occurrence of the productive horizons, strong tectonic disturbance of the geological structure, and so on, OES's are drilled simultaneously with exploratory holes and in addition to them, that is, within the exploratory-hole grid; and

3) at large fields, when exploration is being conducted, anticipatory drilling is practiced at first-priority sites according to the development grid.

Questions of the economic effectiveness of using OES's should be dwelt on in more detail in all three cases.

The application of anticipatory development drilling in order to map in detail the structure of deposits within the presumed oil-zone boundary should be approached differentially as a function of the peculiarities of the structure of the fields of that particular region and of the degree of reliability of preparation of the structures for deep drilling.

There are cases when all or an excessive portion of the exploratory drilling that is saved by OES drilling within a presumed oil-zone boundary is spent on

establishing the actual position of the VNK [oil-water contact]. This is characteristic for deposits that are marked by small size and complicated structure, where there are no sufficiently reliable methods for preparing the structures for deep drilling.

A hypothetical oilfield that is characteristic for Ukrainian conditions, which we designate by the letter B, can be cited as an example that illustrates a similar situation. At this field, after obtaining the first industrial flow of oil for outlining the deposit at the calculated oil-zone boundaries, exploratory holes were drilled. Simultaneously, the drilling of anticipatory development wells started within the estimated boundary. To sum up, 18 prospecting or exploratory holes and 8 anticipatory development wells were consumed in developing this field, whose dimensions were 2.5x1.5 km. Only 7 of the wells were in the field's development inventory: 1 exploratory hole and 6 anticipatory development wells. The remaining holes were outside the oil-zone boundary. The table compares the technical and economic indicators for this exploration variant with those of another variant, under which the field is drilled over just with development wells. The number of development wells that are necessary for full drilling over of the field according to the development grid that was adopted for the given region for such fields is calculated on the basis of the size of the deposits and the presumption that a portion of the holes (in this case, 30 percent of the total number was adopted) falls outside the oil-zone boundary. In the same way as in the example for field A, in order to avoid a large number of unsuccessful holes, the sequence of drilling holes is proposed according to the principle "from the known to the unknown."

In calculating the main economic indicators, this example used the actual average values for the cost and time by type of drilling that had been adopted for the region's conditions to a depth of 3,400 meters. The costs of drilling one exploratory hole and one development well at this field were, respectively, 1,273,000 and 695,000 rubles, and drilling time for them was 340 days (0.93 year) and 227 days (0.62 year). It is tentatively assumed that the drilling is accomplished by three drilling brigades for the variants. The table shows the technical and economic indicators for the variants that characterize the different systems for studying field B.

In comparing the effectiveness indicators for field B, it can be noted that variant 2 has advantages over variant 1. Total expenditures for drilling holes here are 13.3 million rubles less than for variant 1, and drilling time is reduced by 3 years, enabling operation of the facility to start at earlier dates. The calculations indicated that an additional profit of 2.86 million rubles could be obtained in the period of acceleration of the introduction of field B into operation. Moreover, for variant 2, the field proves to be completely drilled over with development wells, yet, after exploration is conducted in accordance with variant 1, the drilling of additional development wells is required for development of the field.

The exploration of deposits that are marked by complicated structure as a consequence of multiple reservoirs, substantial depth of occurrence of the productive horizons and strong tectonic disturbance of the structures is attended by substantial difficulty. The exploratory meterage that is allocated annually for studying the structure of newly discovered deposits or of new sections of fields that are being developed but still have not been studied proves, for the most part, to be inadequate for high-quality preparation of the deposits for purposes of calculating

reserves and, especially, for planning development. Where the structure of the fields is complicated, the use of anticipatory development wells for exploration is especially effective. More rational is a combining of exploratory holes and development drilling from the very start of exploratory operations. In so doing, the exploratory wells face the task of establishing the boundaries of the deposit and of making a general evaluation of it, while the development wells are faced with the tasks not only of recovering oil but also of providing greater detail of the structure and of establishing the dimensions of the various units.

An economic analysis was made of the example of field C, which is situated in Turkmenia, that indicates the effectiveness of using development wells to explore fields of complicated structure. At field C new productive units in the horizons that were the target of development in the main part of the structure were discovered by exploratory wells in the eastern periclinal structure. The deposits were explored simultaneously with exploratory holes and development wells. In accordance with plans for exploration and sampling operations, 14 exploratory holes and 28 development wells were drilled, of which 9 holes (7 and 2, respectively) prove- to be outside the oil-zone boundary. The table compares this exploration variant, which occurs in practice, with another variant, under which the deposit was studied only by exploratory holes.

Calculations were made for an economic evaluation for determination of the cost and time consumed in drilling the holes that were planned, by variant. The results of these calculations are shown in the table. Average actual data on cost and time for drilling one exploratory hole and one development well were used as standards.

In Turkmenia, the average cost for drilling one exploratory hole to a depth of 2,600 meters is 981,000 rubles, while for a development well it is 360,000 rubles. The time spent drilling these holes is, respectively, 236 and 87 days.

An analysis of the data shown in the table indicates that the use of anticipatory development wells for purposes of exploring and preparing the deposit for development leads in variant 1 to a saving in drilling costs that totals 15.3 million rubles, and the drilling time, in this case, is cut by almost 1½ years. The operation of this facility at earlier dates enables 1.2 million rubles in profit to be obtained from the sale of additional crude.

At large, platform-type fields, anticipatory drilling over of first-priority sections of the grid specified by operating schemes for developing these sections or by plans for sampling operation has been practiced successfully recently. An analysis of available examples of the use of anticipatory development drilling at platform-type fields indicates high effectiveness of this measure, which enables continuity in the exploration process, the industrial development of new fields, and the accelerated introduction thereof into development.

At one of the West Siberian fields development wells were drilled simultaneously with exploratory holes on a test plot that was inclined toward a better-studied part of the deposit, in accordance with a design for industrial-test development. By the time the exploration work and the compilation of an integrated scheme for the field had been completed, 53 wells were operating. As for solving questions of completing exploration of a field, anticipatory drilling over of the

first-priority sections enabled: a) discovery of a small gas cap in the main productive horizon; b) considerable refinement of the degree of lithological variability of this horizon; and c) the reception of some additional information on the position of the VNK and the GNK [gas-oil contact] of the overlying productive horizons.

In oilfield-geology operating practice, there are often cases where anticipatory development drilling is used after completion of the exploratory stage when the data of the exploratory holes proves to be inadequate for planning development. The necessity to resort to the use of development wells after completion of the exploration of a field to obtain missing data for calculating reserves and for planning development should be viewed as a compulsory measure for eliminating the consequences of incorrect planning and poor quality in the work done during the prospecting and exploratory stage.

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REFORM OF CRUDE-OIL PRICING URGED, TO REFLECT NEW OILFIELD CONDITIONS

Moscow EKONOMIKA NEFTYANOY PROMYSHLENNOSTI in Russian No 8, Aug 80 pp 2-4

[Article by S. M. Levin (Minneftepron [Ministry of Petroleum Industry]): "Tasks for Further Improving Price-Setting for Crude Oil"]

[Text] A rise in the scientific level of national economic planning and an intensification of the effect of the economic mechanism on raising production effectiveness presuppose the solution of tasks for improving planned price-setting.

Economically substantiated price levels help in correctly forming progressive proportions of the national economy and in stimulating scientific and technical progress and growth in effectiveness.

Wholesale prices for crude oil now perform basically a cost-accounting function but their level does not reflect the value of this unique and nonrenewable product of nature to the economy.

Improvement in methodological principles for setting prices for crude is impossible without taking the changing conditions for developing and siting the oil industry into account.

The period following the 1967 reform was marked by substantial changes in the development and siting of the oil industry. During this period the centers for oil recovery shifted to new regions that have severe natural and climatic conditions; at the old oil regions poorly productive and small deposits were brought under development, and there was an increase in development drilling, with a simultaneous growth in average depth and a reduction in initial flow rates of the wells.

In recent years profitable operation of oil-recovery associations that are developing fields with different geological conditions for oil recovery has been made possible by a substantial differentiation of the industry's average wholesale price for crude oil and by the use of other economic standards.

Thus, while 7 price levels for oil had been set in 1967, there were 17 levels in 1977. Moreover, changes were made in the rates for rental payments, in standards for payment for the use of productive capital, and in rates for deductions for reimbursement of expenditures for geological exploration.

In 1979 rental payments were completely abolished and the average standard of payments for the use of capital was reduced for the industry to 3.9 percent, instead of 6 percent.

Frequent reviews of enterprise wholesale prices for crude have adversely affected the stability and comparability of the association's economic indicators. The abolition of rental payments and full or partial release from payments for the use of production capital, which stimulated better use thereof, and the reduction or abolition of deductions for geological exploration work--none of these measures have promoted effectiveness of the indicated economic control levers.

The 2.3-fold rise in wholesale prices for crude that is called for will enable a certain improvement in the cost-accounting mechanism of oil-industry operation. The number of pricing zones will be reduced to three. The level of prices will differ by a factor of 2.6 from the maximum.

For oil refineries, a single price level for base oil shipped is called for.

New pricing lists for crude have already been approved. Much preparatory work, which was done with the participation of the industry's scientific-research institutes, preceded this.

The stability of price level and the effectiveness of such economic categories as rent, payment for the use of capital, and reimbursement for geological exploration are functions, in the recovery branches of the industry, primarily of the influence of the natural factor.

Deterioration of geological conditions for recovery complicates the techniques and technology for recovering crude at oil fields that are being developed.

Fields of highly viscous crude and of subgas deposits, fields with low permeability of the stratum, and fields that are remote and small are being brought into development in ever-increasing volume; and wells are being completed in new regions with large, deep deposits.

Under these circumstances, the oil-recovery process should be provided with continuously increasing amounts of water that is injectable into the stratum and with sampling of fluid that is increasingly water-encroached.

Because of this, it is necessary to do more work on oilfield construction, to create capacity both for injecting water and for preparing stock tank oil, and also for cleaning aggressive brine water.

The capacity being created each year as a result of the large amount of drilling work done will go, for the most part, into compensating for reduction in oil recovery at fields that are being depleted.

With a view to covering the influence of negative factors in the oil industry to some extent, an integrated program of scientific and technical progress is being accomplished that is aimed at solution of the most important problems--a substantial reduction of labor intensiveness in servicing the main units--the oil wells, and more complete withdrawal of oil from the ground.

In order to increase the withdrawal of oil from the ground, work is being conducted intensively to create and introduce basically new operating processes for stimulating oily strata, technical means for pumping into the stratum various

reactants that are able to drive and to wash out the oil, as well as steam, gas, hot water, and air for in-situ combustion.

The stimulation of work to increase the use of the ground's natural resources and the creation of favorable economic circumstances for introducing new methods for increasing withdrawal from the reservoir are extremely urgent. In the first stage of their use, these methods increase expenditures that are not covered by current realization of output; an economical attitude toward natural riches should, in the oil industry, be profitable for the industry and for the cost-accounting production associations.

Such levers of economic control as the price of crude should have been used in the industry for these purposes.

However, it is impossible to use the pricing mechanism to introduce methods for increasing oil withdrawal because of the noncorrespondence of the existing and the new levels of oil prices to the amounts of the outlays for production and the adduced expenditures for new technological processes.

The petroleum industry has been compelled to take the following measures to equalize the economic prerequisites of a new complicated technological process for oil recovery and of the traditional process, which involves substantial underutilization of natural resources:

measures for the new technological processes are evaluated by comparing the outlays for the new methods of recovery with a special standard for adduced expenditures per ton of increase in oil recovery.

The value of the indicated standard, which exceeds the existing price 5-fold and the new price 2.2-fold, was determined on the basis of the adduced expenditures for the worst group of fields whose development is specified by the five-year plan;

expenditures for the period for mastering the new technology are reimbursed through a special fund for increasing oil withdrawal from the ground, the amount of which should rise during the forthcoming five-year plan; and

incentives for the new methods for raising oil withdrawal are made as a function of the additional oil recovered through the new technology. The material incentive fund for these purposes is created by deductions for the increased cost-ton rate.

The development and application in the industry of such an economic mechanism will, over a definite time period, help economically to improve the use of natural resources. The period during which the level of the enterprises' wholesale price for crude provides for stable settlement profitability is the period that this rational mechanism will be used.

The drop in profitability of some associations that has been ascertained, the substantial reduction in the potential for regulating cost-accounting activity through rental payments, and the need for partial abolition of such economic-control levers as payment for the use of production capital and reimbursement of expenditures for geological exploration point to an inadequacy of the period of stable effect of the new wholesale oilfield prices for crude oil.

Because of this, work to improve the enterprises' wholesale prices for oil should be continued.

Improvement of price-setting in the oil industry should embrace not only questions of providing for the normal cost-accounting activity of enterprises and the industry but also for the conservation of oil reserves and incentives for consuming oil economically.

The problem of an economically substantiated level of wholesale prices for crude oil should be examined primarily from the standpoint of the properties required of the oil and its role in the country's economy.

Crude cannot be viewed as an interchangeable type of boiler and furnace fuel; it should be examined primarily as a raw material for the production of petrochemical output and of motor fuels and oils which must be used with maximum economy, extracting the potential content of valuable fractions to the maximum.

The problem of setting prices for crude must be solved more drastically with a review of existing principles and methods for devising prices.

It can be said today that definite economic and production conditions for raising the problem of establishing a single price for crude oil without regard to prices for coal, gas or other types of fuel are taking shape in the petroleum industry.

Work to improve price-setting in the oil industry should be aimed at substantiation of wholesale oilfield prices for oil that would consider the conditions for developing the worst fields.

Wholesale prices established on the basis of the relatively worst fields whose development is called for by the optimal plan for developing the industry would enable the national economy's expenditures for each ton of increase in oil recovery to be reflected more correctly. The use of such prices is necessary not only for purposes of insuring the profitability of developing the indicated fields but also for evaluating objectively the economic effectiveness of the measures being executed in the industry to increase oil recovery at the fields being worked: improvement of systems for developing oilfields, the introduction of methods for increasing withdrawal from the productive strata, the use of new technological equipment and processes for recovering oil, and so on. Each additional ton of oil recovered through the indicated measures will enable the load on the relatively worst fields to be reduced, and so an economic evaluation of this crude should be identical in both cases.

The necessity for improving price-setting in the oil industry in the indicated area arises also from national economic criteria for evaluating the effectiveness of a type of raw material such as crude oil that is in severely short supply. An increased price level for oil will give economical effectiveness to many measures for conservation of oil and petroleum products, the rational use thereof, and even replacement by less critical types of fuel and energy resources. Each ton of crude saved as a result of this will reduce the load on the relatively worst fields; this will necessitate a uniform national-economic evaluation of the effectiveness of measures for building up the recovery of oil or for its economical use.

The adoption of such a principle for constructing prices for crude oil will help in the economic replacement or even a sharp restriction on the use of mazut as boiler fuel and in the conservation of crude oil in order to satisfy the more highly rated needs of the national economy.

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GOR'KIY-YAROSLAVL' SECTION OF TRANSCONTINENTAL OIL PIPELINE FINISHED

Moscow IZVESTIYA in Russian 24 Sep 80 p 1

[Article by B. L'vov: "An Oil Pipeline of Steel"]

[Text] A new main oil pipeline has now joined two ancient Volga cities together--Gor'kiy and Yaroslavl', two major centers of petrochemistry and crude hydrocarbon refining.

The last section of the pipeline dropped from view into the marshy quagmire with a dull splash providing the final punctuation to almost 400 kilometers of hard work. The "cradles" supporting the pipeline relaxed, and the booms of the pipe layers straightened back up.

"Well, you've walked the distance, I congratulate you!" Glavtruboprovodstroy chief G. Borisov vigorously shook the hands of the builders and installers of the integrated pipelaying team.

"Swan would have been a better word," Hero of Socialist Labor V. Tsvetkov, team leader of a mechanized column of Mosgazprovodstroy Trust corrected him half-jokingly, half-seriously.

A distinguished mechanic who had worked on pipeline routes for a quarter of a century, he described quite accurately the situation they faced in the northwestern leg of the first Surgut-Polotsk transcontinental petroleum pipeline. Impassable thickets and swamps were aplenty in Ivanovskaya, Kalininskaya, and Yaroslavskaya oblasts.

But despite these difficult conditions the collectives of the Ryazan'truboprovodstroy and Kuybyshevtruboprovodstroy trusts, the welding and installation trust, Mosgazprovodstroy, and others adopted higher pledges in honor of the 26th CPSU Congress. Specific targets were determined for every subdivision--the welders, the insulators, the excavators, the divers, and the electricians, and a competition for fastest attainment of these targets was initiated throughout. All subdivisions, enterprises, and organizations participating in construction of the petroleum pipeline began operation according to the "workers' relay" principle.

Builders of the Ministry of Construction of Petroleum and Gas Industry Enterprises wrested every favorable hour from the whimsical weather. Sometimes the progress diminished to just a few meters a day, but what was most important was that these meters always led the builders forward.

And now was the time of a distinguished labor victory, of successful satisfaction of adopted pledges. Line work has now been completed in another section of the route of the Surgut-Polotsk transcontinental petroleum pipeline, from Gor'kiy to Yaroslavl'. Running tests of the main are now beginning. The length of the giant petroleum transportation artery has now reached two and a half thousand kilometers--more than two-thirds of the planned length.

Siberian oil is awaited by enterprises of the Northwest, Belorussia, and Lithuania. This is why every day gained in satisfaction of the precongress pledges is so precious. Eight hundred kilometers of the main pipeline still lie ahead. There are still many pumping stations, power and communication lines, roads, residential settlements, and reservoir complexes to be built and installed.
[24-11004]

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HUGE OFFSHORE DRILLING PLATFORMS PROGRESS

Baku VYSHKA in Russian 14 Oct 80 p 2

[Article by V. Tikhonov: "The Depths Will Also Be Conquered"]

[Excerpts] "The deepsea foundation," said Ayaz Mamedovich Salmanly, chief engineer of "Kaspmorneftegazstroy" Trust's Construction and Installation Administration No 4, "which was planned by the 'Gipromorneftegaz' [not further identified], consists of two blocks. The height of each in the sea, less the superstructure, is 110 meters, and each weighs 2,000 tons. Never before has the domestic practice of building hydraulic engineering structures witnessed such proportions."

Caps with a diameter of 1,420 millimeters, intended for experimental pile driving, were recently manufactured. They are being tested as part of the collective's production program. The reason for this is that this will be the first time in the practice of platform construction that driven piles 180 meters long and weighing 150 tons each--several dozen times more than conventional piles--will be used. This is why it is important to test the strength of the manufactured piles now, and at the same time test the work of the steam hammer installed aboard the powerful crane ship "Azerbaydzhan".

Naturally many technical problems associated with the dependability of the erected metallic structures are arising in the course of the work. The Kiev Institute of Electric Welding imeni Academician Paton has been providing and continues to provide considerable resistance to the administration in this. First off, the institute determined the weldability of different grades of steel and it developed a progressive process for welding so-called plain units.

The team leader has been involved in the construction of offshore foundations for almost 20 years. Prior to this, Mikhail worked at a metallic structures plant, where not that long ago he took part in assembly of a foundation erected for the Platform imeni 28 Aprel' at a depth of 84 meters. At the moment this is a record. The platform presently under construction will stride even further out to sea, where the depth will be 150-200 meters. And awareness of participation in a great and important effort elicits enthusiasm among the installers, a desire to invest all of their experience and proficiency into the work.

Powerful equipment, in particular two caterpillar cranes with a lifting capacity of 300 tons each and a boom extension of up to 50 meters, built by the West German Demag Company, are supporting the efficient work of the block's installation.

Thus the steel skeleton of the future platform's first block is growing from one day to the next. And yet this structure is unique not in terms of its overall dimensions--similar "islets" now stand, for example, in the North Sea--but rather in the principle itself according to which it is to be delivered to the place of drilling of the exploratory wells. Considering the tremendous weight of each block, 2,000 tons, it was deemed impossible to load and unload them even with a crane having a lifting capacity of 2,500 tons. Specialists of the "Gipromorneftegaz" resolved this problem owing to the positive buoyancy of the block, attained through inclusion of large-diameter pipes in one of its edges.
[24-11004]

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INEFFICIENT COAL COUNTERSHIPMENTS PLAGUE RAILROADS

Moscow EKONOMICHESKAYA GAZETA in Russian No 36, Sep 1980 p 15

[Article by Yu. Grechanik, Ministry of Railways Press Center: "There and Back"]

[Text] The railroads were the pioneers in solid fuel transportation. And of all the cargo conveyed on the roads of steel, coal is the biggest. It contributes 20 percent of the shipping volume. This requires more than 30,000 rail cars today. Even more will be needed in the future. After all, coal mining and its significance to the fuel and energy balance of the national economy are growing. An urgent need for sensibly organizing coal shipments is arising in this connection.

Times when coal must be shipped to coal-producing regions makes sense only as unusual incidents, dictated moreover by extraordinary circumstances. In 1974, for example, coal mining was halted for a number of reasons in the open pit supplying fuel to the neighboring Angrenskaya GRES. Naturally under these conditions a decision was made to import coal.

Of course, this need was soon eliminated. But the coal kept coming to the Kirghiz SSR from Uzbekistan as before. Supply organs of "Sredazugol'" ignored the protests against this practice. They also remained indifferent to the fact that the imported fuel was more expensive than the electric power produced. Only when the growing heap of coal exceeded the normal reserves by many times did things begin to move. The solution decided upon was to carry the coal from the Angrenskaya GRES to the Kirghiz SSR and Kazakhstan.

Thus a time of countershipments began, and they lasted for about 5 years. The transportation outlays totaled more than 10 million rubles. Has the Soyuzglavugol' [Main Administration for Interrepublic Deliveries of Coal] made the proper conclusions from this fact? No. Fuel traffic to Angren and out of Angren has been foreseen once again in the main administration's cargo traffic plan for the current year and for subsequent years. Only the resolute objections of the railroaders are for the moment blocking such shipments.

Countershipments of solid fuel may be observed on many railroads. As an example millions of tons of coking coal are sent each year from the Kuznetsk Basin to the Ukraine each year. Here, it is processed into coke, and then returned, for a distance of 5,000 kilometers.

Well then, how can we explain the fact that Donets coking coal is being shipped into the Kuznetsk Basin? We find that, as the supply organs assert, "this is dictated by the interests of some enterprises in West Siberia." They demand Donets

brands specifically because their use is foreseen by the production process. Others, such as the Yurga Abrasives Plant, refused to accept Kuznetsk brands because "unit consumption of coal and electric power would increase." The fact that the long shipments are more expensive is not taken into account.

Coal intended for power production is also a participant of the long countercurrent runs. Millions of tons of this coal participate in a gigantic "marathon" each year from the Kuznetsk Basin into the western oblasts. Meanwhile Donets coal is conveyed in the reverse direction--to Gor'kiy and Yaroslavl'. Can this delivery system be improved?

This question was answered in a joint document of the USSR Gosplan and the USSR Gossnab, the gosplans and gossnabs of the union republics, the Ministry of Railways, and other interested ministries back in 1969. In it, the shipments discussed above and a number of others were recognized to be irrational. Plans were made to halt deliveries of Donets coal into some oblasts in the country's European section, including Yaroslavskaya and Gor'kovskaya. But since that time, little has changed.

Economists assert that beyond a certain limiting distance of large proportions, coal shipment by rail becomes irrational. The coal becomes too expensive to the consumers. But here is an impressive figure: In the last 4 years the average distance over which solid fuel is conveyed by rail increased by 103 kilometers.

And here are the remunerations of this growth: In the 4 years, transportation of the coal cost the consumers 118 million rubles more than it would have cost, had the previous average distance been maintained. As far as the railroaders are concerned, they had to do an extra volume of work totaling 75.5 million ton-kilometers.

Of course the coal transportation distance issue is not simple. Solid fuel extraction is growing mainly in the eastern regions, and the main consumers are in the European part of the country. Unfortunately in addition to the unavoidable and justified routes, there are many unjustified, excessively long ones. Thus each year a million tons of Kuznetsk coal are conveyed a little more than 4,000 kilometers to Arkhangel'skaya and Murmanskaya oblasts and to the Karelian ASSR. And yet this zone is supplied by similar fuel mined in the Pechora Basin.

What is the problem here? First, Kuznetsk coal is more than twice cheaper. Second, the railroad charge for superlong shipments has been repealed. The cost of delivering fuel from the Kuznetsk Basin is two and a half times greater than from the Pechora Basin. On the whole, however, Kuznetsk coal costs consumers in the northern regions less than Pechora coal.

Recall that it was concluded in 1978 that these shipments had to be stopped.

Here is another example. The railroad from the Kuznetsk Basin to Dushanbe is more than 4,000 kilometers long. The line to Ashkabad is just as long, and to Tashkent it is slightly shorter. But neither this circumstance nor the fact that the railroads are overloaded is taken into account when the annual deliveries of 400,000 tons of Kuznetsk coal to the municipal and personal services enterprises of these three cities are organized.

Meanwhile, it was 11 years ago that it was recognized possible and necessary to switch the municipal and personal services enterprises of Central Asia to locally acquired fuel and to gas and fuel oil.

As we can see, many plans have been made for eliminating irrational railroad shipments of solid fuel. Many of these plans have been around for a long time. It is time to finish their implementation. And if we are to exert economic leverage upon the problem, we would probably find it worth it to reinstate the distance-based rates. Then conveying coal to the distant corners of the country would become disadvantageous. Except, of course, in cases where this is dictated by urgent necessity.
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FUELS

FAR EAST COAL DEPOSITS OPENING UP

Moscow IZVESTIYA in Russian 27 Aug 80 p 2

[Article by V. Kurasov, V. Letov, and A. Pushkar': "Mines By the Ocean"]

[Excerpts] It was a typical day. A day of successes and failures, of concerns and alarms, and of concealed tension and labor zeal. But the general director's office was empty.

"We are dealing with a unique deposit," Anatoliy Vasil'yevich told us. "I know what it is like in the Donets Basin, the Kuznetsk Basin, and the Urals. But I have never come across such an easy deposit, one that yields so well to mechanized coal mining. Coal mechanization can be organized in all the longwalls--considering our shortage of manpower, that would be a blessing to us."

He was talking about the Urgal region, through which the Baykal-Amur Rail Mainline passes. It also crosses the Lianskoye deposit, located so obligingly close to the Komsomol'sk-on-Amur industrial center, and so suited to open development. As far as Amurskaya Oblast is concerned, there are several deposits here containing billions of tons of brown coal, deposits at which huge open pits could be created. These are the Svobodnenskoye and Yerkovetskoye deposits, located not far from the Trans-Siberian Railway, and the Ogodzhinskoye deposit, 150 kilometers north of the Baykal-Amur Rail Mainline.

Then the discussion turned to Primorskiy Kray. The territory of the kray begins with the Bikin River as a solid deposit of brown coal. The Luchegorskiy open pit and the Primorskaya GRES are already operating here. As soon as all of its blocks are placed into operation, the latter will become the largest thermal electric power plant beyond Lake Baykal. But have all of the possibilities been exhausted here yet? Far from so. And south along the railway extends an entire series of oval spots--coal beds, some of which are already being worked as open pits, and others of which can be placed into operation. One of the coal deposits is located right next to the city of Ussuriysk and its plants. The Vladivostokskaya TETs-2 is also standing right on a coal bed.

And so, coal is everywhere. Nevertheless for some reason we continue to import it to this area from places thousands of kilometers away. An additional burden is placed on the railroads, which are already overloaded, and each year thousands of rail cars must be allocated for the coal shipments. All of this costs millions of rubles.

How is all of this explained? Apparently during the last five-year plans the growth rate of industry in the Far East Economic Region significantly surpassed development of the fuel and power base, particularly that of the coal sector. Earlier, hopes had been placed on liquid fuel and gas, which were supposedly to replace the coal traditional to this area. But the great oil deposits have still not been found. Nor was gas found to be all that abundant. And while the debates went on and the hopes were shifted from one solution to another, the geologists packed up and left without exploring the coal deposits.

And so, the results: Many deposits are plotted on the map, but they have not been explored in detail, their reserves have not been confirmed, and not one of the deposits is ready for immediate planning and construction of enterprises. After the geologists left, the builders also dropped the interests of coal industry into the background.

Attentively analyzing the affairs of each enterprise, Lisurenko was the first to grasp the full urgency of the situation. He could see what all of this could lead to within the next few years. And so he began searching for a solution, for ways to strengthen the fuel base.

Carefully weighing the possibilities, he came to the conclusion that we could not only compensate for the drop in extraction volume at the old mines, but we could also completely eliminate importation of coal into Primorskiy Kray by 1983. A program for accelerated development of coal industry in the Far East was written. It was discussed at meetings of the Plenum of the Primorskiy Kray CPSU Committee and the governing board of the USSR Ministry of Coal Industry, and it was approved.

During this five-year plan the association increased coal extraction by 2 million tons. The volume is still growing today. A new influx of creative initiative was evoked by decisions of the June (1980) Plenum of the CPSU Central Committee and by sessions of the USSR Supreme Soviet, decisions calling for fuller utilization of local raw materials. Preparing for the 26th CPSU Congress, Far East miners are adopting high pledges, and they are intensifying the pace of the effort to prepare the coal mining front for the 11th Five-Year Plan. Concerned about present-day production as well, the general director never loses sight of the enterprises, sections, and mechanisms that would permit the association to raise the extraction volume by the 30 percent planned in the new five-year plan.

We drove to the Mine imeni Artem. The dirt road wandered away from the rail route, winding around the hills. The fate of this enterprise is unusual. Fifteen years ago the association dug a temporary exploratory mine through its own resources. But within the very first years of its operation it exceeded its planned capacity (100,000 tons), it paid back the assets invested into it, and now it is producing a million tons of fuel per year. Back in 1973 specialists of the Dal'giproshakht Institute and the Kuznetsk Scientific Research Institute of Coal established the technical-economic grounds for building mines here, at the Shkotovskoye deposit. The USSR Gosplan examined them many times, but it has still not approved them, even though all of the uncertainties in the plan and all of the doubts have long vanished.

After all, the Mine imeni Artem is already the largest and the most fully mechanized mine in Primorskiy Kray, and it provides the cheapest coal available.

Moreover it can operate for another hundred years, and it could produce two and a half million tons of fuel per year. In order to raise its output to this level, the association began rebuilding it through its own resources. This is a component of that reserve upon which elimination of the kray's coal shortage in 1983 will be based.

Descending down a shaft dependably secured by metallic supports, and cleaned and white-washed like a subway station, we reached a chamber in which the mechanized complex discussed at the conference was being installed. The coal bed gave off a rich luster along the sides, and powerful steel muscles--the rods and cylinders of the complex' sections, arranged in a row a hundred meters long, held the solid earth on their shoulders. The mine was designed for full conveyerization, and the river of coal will flow from the faces right to the rail cars; people will also move along the belts. Such are the designs, and they are already being implemented. The mine is working!

Before us was a ravine with a green dale traversed by the black trench of the open pit. This place is called Kalyaginskiy Spring. Here, within the limits of the mine, millions of tons of coal lie not very deep. In the next 5 years 800 tons of coal could be extracted from here per day, and it will be twice cheaper than the association average. Also here in this valley, another deposit, this one containing 5 million tons, will be prepared for open mining as well.

A bed resembling a droplet is marked off beyond the outline of the deposit. This is the site of the new Severo-Zapad section, which is also already producing coal. For the moment it is being shipped out by motor vehicles, and a rail spur is being laid to this point at a forced pace. The "droplet", as the bed is referred to locally, should replace the spent Yuzhnyi section. And not far away from the horizon the land is traversed by a trench with rails on its floor. This is the site of the Pavlovskiy open pit, which will go into operation in the new five-year plan and will produce 4 million tons of coal per year.

Especially great plans are associated with the Urgal region (in the future, an open mine and two shafts with capacities of 7 and 5 million tons will be built here). And the personnel situation is especially difficult here. Outlining the plan of action to develop coal industry, Lisurenko and those of similar persuasion recognize that whoever creates the best material, personal, cultural, and moral conditions will attract the workers. And so the program they have written up includes an entire complex of sociocultural measures, and housing construction.

Estimates have been made for up to 1990 and the year 2000 for the Far East Economic Region as a whole. Achievement of these plans depends not only on the initiative and resourcefulness of the association's collective, but also on the efforts undertaken by the Ministry of Coal Industry, the USSR Gosplan, and other agencies. It is precisely on a unification of effort that implementation of the program through which local coal industry will fully support the needs of the Far East's growing economy depends.
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BRIEFS

KERCH' SUPERTANKER CONSTRUCTION--Kerch' (Krymskaya Oblast), 15 Aug (TASS). The oil-tanker fleet has been augmented by a series of supertankers. Workers of Zaliv Shipyard imeni B. Ye. Butoma today ceremonially transferred the last ship of this type, "Sovetskaya neft'," to the sailors. Its load-carrying capacity is 150,000 tons. "Sovetskaya neft'" is an ordinary supertanker. The first of the series--the "Krym"--was built in 1975. After it followed the "Kuban'," "Kavkaz," "Kuzbass" and "Kribass." The "Sovetskaya neft'" was built one-third faster than the lead ship, and its cost has been reduced by almost 10 million rubles. Kerch' shipbuilders are using their experience in building the supertankers during the construction of a new series of large oil-carrying ships of the "Pobeda" type. The enterprise's workers have given their word to launch the first of them into the water ahead of time, by the day the 26th CPSU Congress opens. [Text] [Moscow PRAVDA in Russian 16 Aug 80 p 1] 11409

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